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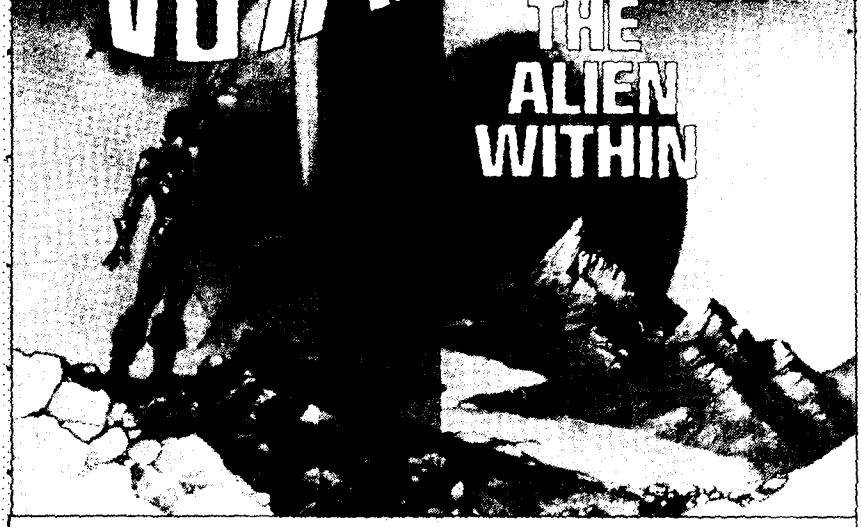

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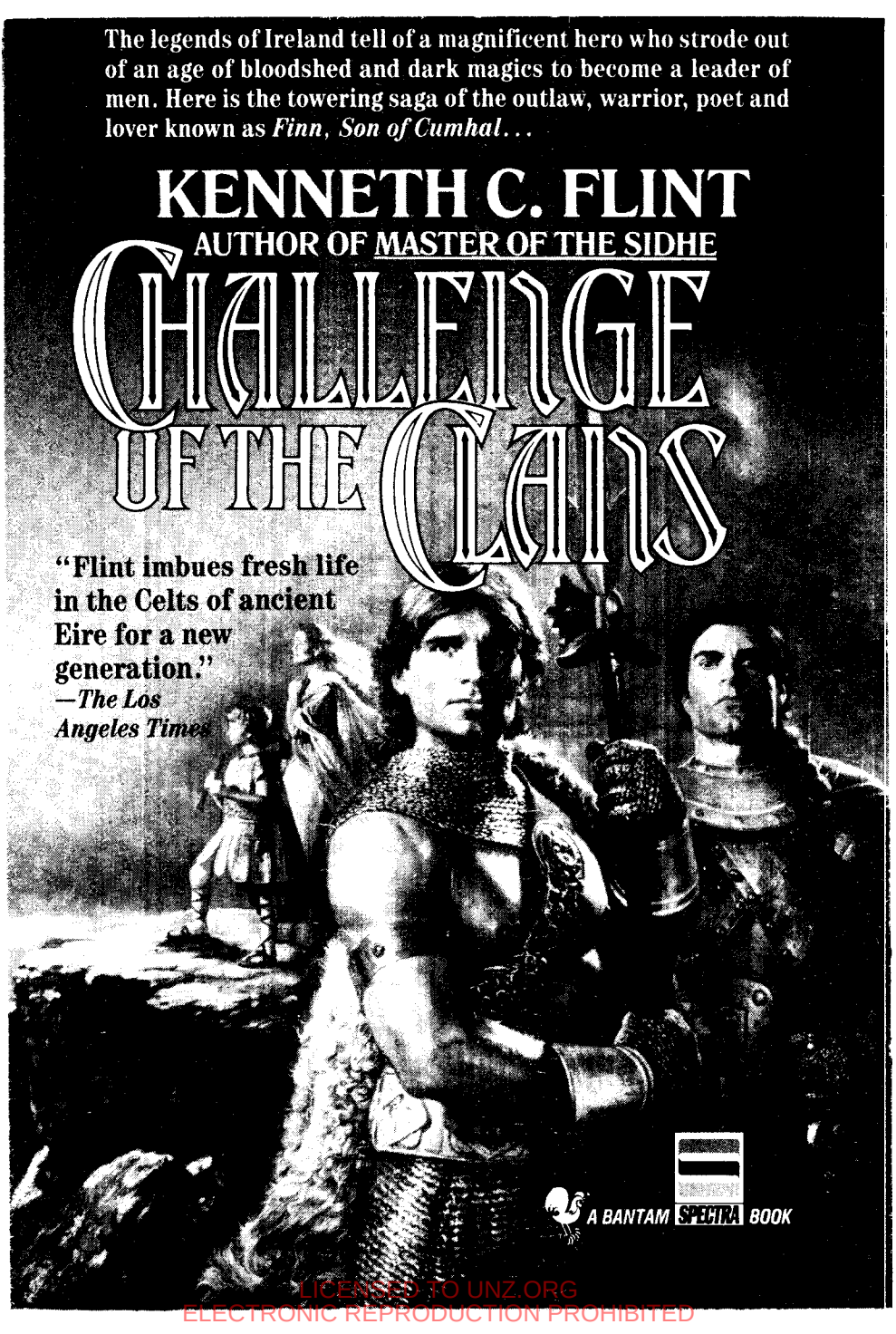

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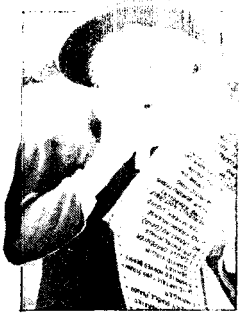

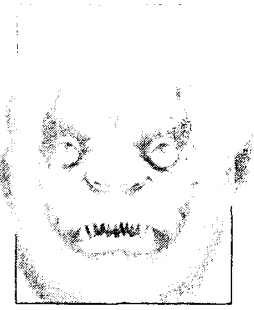

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Serial

THE COMING·OF THE QUANTUM CATS, Frederik Pohl, Part Three of Four ____ 122

Novelettes

JOINT ACTION, J. Brian Clarke ____ 10
2E6, John Barnes ____ 90

Science Fact

BEFORE THE BIG BANG, Dr. John Gribbin ____ 50

Short Storeis

THE GENTRIFICATION BLUES, W.T. Quick ____ 62
ACCELERTION CONSTANT, Robert L. Forward ____ 76
THE BARBECUE, THE MOVIE, AND OTHER UNFORTUNATELY NOT SO RELEVANT MATERIAL, Harry Turtledove ("Eric G. Iverson") ____ 166

Reader's Departments

THE EDITOR'S PAGE ____ 4
IN TIMES TO COME ____ 88
ON GAMING, Dana Lombardy ____ 89
THE ALTERNATE VIEW, John G. Cramer ____ 117
THE REFERENCE LIBRARY, Tom Easton ____ 177
BRASS TACKS ____ 185
THE ANALOG CALENDAR OF UPCOMING EVENTS ____ 192

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Indicia on Page 6

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Editorial

MISSING LINKS

Stanley Schmidt

Some years ago a friend of mine came up with a conjecture that I think you, too, may find worth some thought—though I suspect the conclusions you eventually reach may differ a bit from your first expectations. It concerns the most basic origins of science—and the possibility that there may be whole fields of science whose existence we may not even suspect because of fundamental limitations in our makeup.

All the thinking we do seems to happen in a couple of pounds of protoplasm locked firmly inside our skulls and linked to the outside world by our senses. All we "directly" know about what's Out There comes through these conduits, of which there is a finite and rather small number (commonly, though perhaps misleadingly, quoted as five). We *think* we know a lot more, but all that we've deduced—which means almost the entire body of what we call scientific knowledge—is ultimately the result of the processing of data obtained through sensory inputs.

Our knowledge of the physical sciences, for example, grew largely out of early man's preoccupation with astronomy. He had to know when to plant, when to harvest, when to move on—and he noticed quite early that the motions of the lights in the sky called stars provided a way to keep track of these things. Somewhere along the line he noticed that the Moon and a few of the smaller lights did not move as the others did; thinking about that eventually led to Newton's theory of universal gravitation.

And so on.

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What if our distant ancestors hadn't been able to *see* the stars? The calendar might still be an undreamed-of concept, and without it we might still be hunter-gatherers, much less numerous and confined to the tropics, where seasons don't matter so much. Lacking any notion that there was more to the universe than the ground we saw around us, we might never aspire to anything else. Universal gravitation would be as remote from our thoughts as nuclear fusion, the Fermi paradox, or faster-than-light travel.

People steeped in science fiction can easily and plausibly imagine a variety of such scenarios. There may be worlds with inhabitants in just such a plight, whether because their sensory repertoire evolved without sight or because a perpetually clouded sky hides the rest of the universe from their view. And there, but for our eyes and our clear skies, go we. You may argue that the idea of evolving without vision is far-fetched and highly improbable, but that claim is hard to support. It's true that a being which can see will often have powerful evolutionary advantages over others which cannot, so the survivors in an environment where *any* species evolved sight will tend to have it. But there are plenty of specialized environments on Earth with inhabitants lacking sensory capabilities which are common elsewhere. Cave dwellers don't have sight because they would have no way of using it; even animals that do have sight vary widely in such details as visual acuity, spectral range, and color discrimination. It's not terribly difficult to imagine an entire world in which *no* organisms evolved sight, perhaps because some evolved something else first (such as the sonar of bats or porpoises) and did well enough with that to keep the upper hand without more radical innovations.

And now my friend's speculation: if we can imagine a world without sight —and consequently without astronomy, optics, and all the other branches of science that sprout from it—is it possible that we ourselves lack some sense which would lead us to whole new categories of phenomena whose existence we now don't even suspect? Or might there be species in the galaxy that have such senses and have therefore developed entire sciences which would be utterly incomprehensible in terms of what *we* know?

The idea is intriguing and certainly bears thinking about. It's the kind of thinking best done by science fiction writers: concocting self-consistent speculations on things that *could* exist, and their consequences if they did, with no evidence in hand for whether they actually do, or, if so, what forms they take. A science fiction writer is free to postulate any possibility he can make plausible, and let it generate stories. And some of the possibilities he imagines just may turn out to bear at least a faint resemblance to something that actually exists somewhere.

However, it may not be as easy as it sounds. Intelligence itself is not to be underestimated. Once you have that, your knowledge and understanding are not necessarily limited to things you can see directly. Watching the motions of stars and planets certainly makes it *eas-*

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ier to think of astronomy; but does it necessarily follow that if you couldn't see them, you must remain forever ignorant of their existence? I'm not so sure. If you don't have sight, you're likely to learn to do far more with the senses you do have—as just about any blind person can probably tell you in fascinating detail from his own experience. If we had evolved without vision, some of us living near the ocean might still have become curious about tides, and eventually come up with a more or less accurate picture of a universe containing at least the Sun and Moon to explain them. If pursued, that could lead to still more—and the process might not even be as slow as we photon collectors tend to assume. The lack of a sense providing direct clues to a branch of science may not determine *whether* that branch develops, but merely when and how.

One way or another, any branch of science deals with what may be loosely

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described as "forces," here defined to mean anything which produces a detectable change—*and a change produced by one force may be detectable by means of another*. Human beings do not, as far as we know, directly sense the Earth's magnetic field—but we know it's there. In fact, we have a very detailed picture of it, because we can *see* the effect it has on certain kinds of metal needles, and we can think about what might cause that effect. If we couldn't see, we could still discover electricity and magnetism if we ever got our hands on things like lodestones and cat pelts. If we learned enough about electricity and magnetism, we could then deduce that light *has* to exist, whether we could see it or not. (You've probably seen the poster that says, "And God said, [Maxwell's equations], And there was light!") Once we had predicted the existence and properties of light, we could then devise instruments to detect it for us.

Much of the science we now know has in fact been built up by such use of the interconnectedness of things. We may speculate on whether we would have astronomy or optics if we didn't have eyes; but astronomy and optics turn out to be not truly fundamental branches of science, but merely particular applications of what we now know as the gravitational and electromagnetic interactions. In fact, *all* of our senses are electromagnetic, with an occasional admixture of gravitational influence. Yet we do know of at least a couple of other fundamental forces (the strong and weak nuclear interactions), even though we are not equipped to perceive them directly. We have learned about them because they produce effects which we can observe by means of the interactions we can perceive—but we can then deduce from the way they behave that these effects are *produced* by something else.

However, none of this warrants casually dismissing the speculation about whether fundamentally new fields may exist and yet lie unsuspected on the grounds that, "If they existed, we would notice their effects." I suspect there's a good chance we *can* notice their effects, eventually, but it does not necessarily follow that we would *already* have noticed their effects. The strong and weak interactions have only been known for a very few decades, and we're still looking for—and still finding—things we've never "seen" before.

I suspect we're far from finished. ■

● I can more easily believe that two Yankee professors lie than accept the notion that stones can fall from heaven.

Thomas Jefferson, 1808.

Submitted by G. Harry Stine

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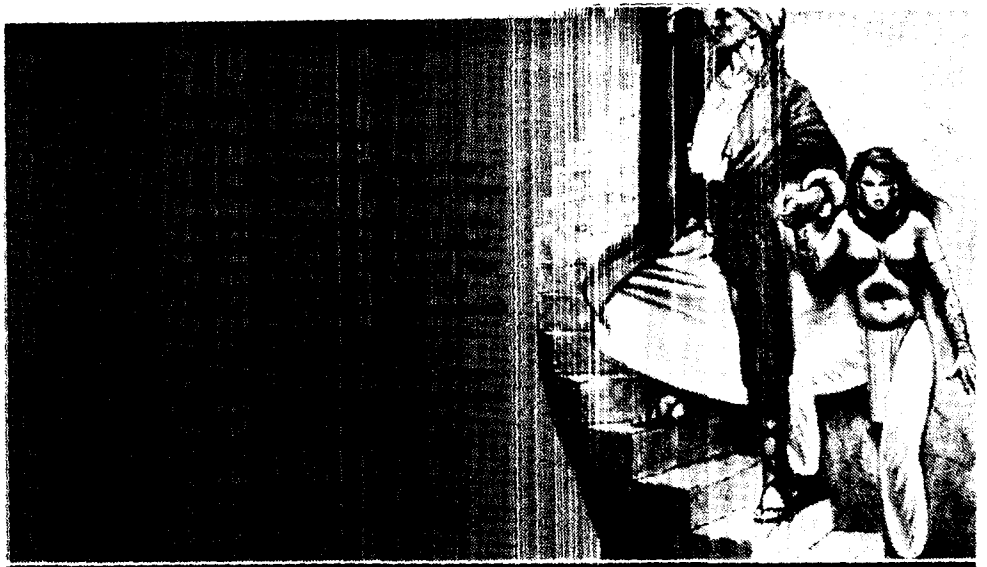

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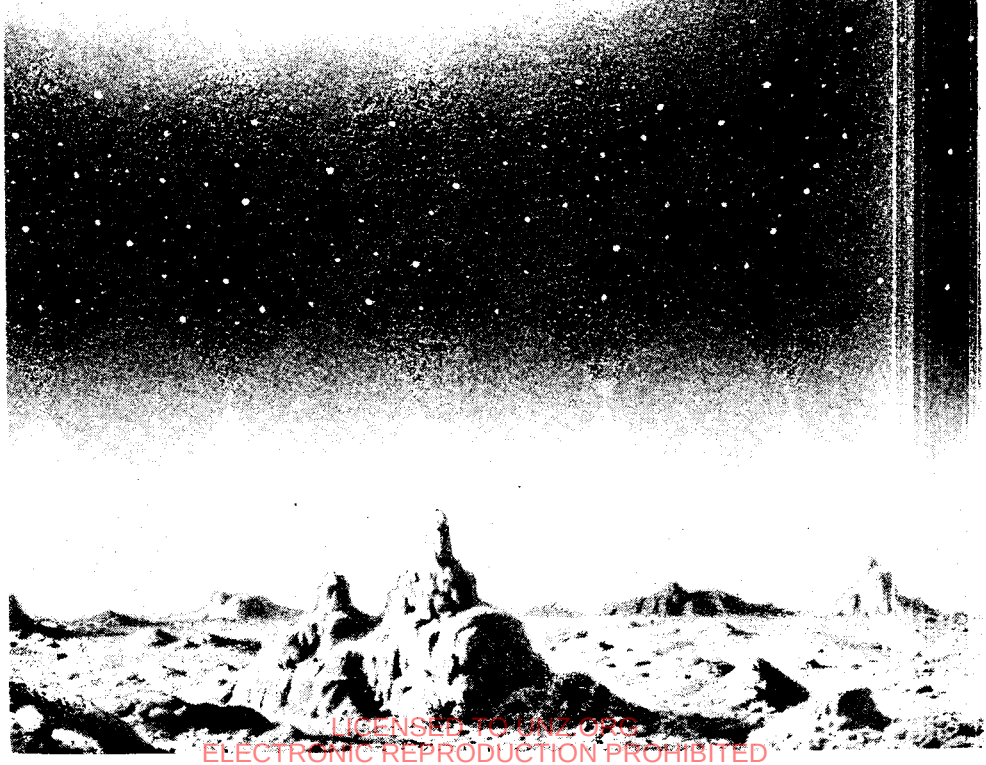
J. Brian Clarke

JOINT ACTION

Cooperation is a delicate thing—
especially when those
who must cooperate
are very different, neither wants
to do what must be done,
and it may be too late anyway.



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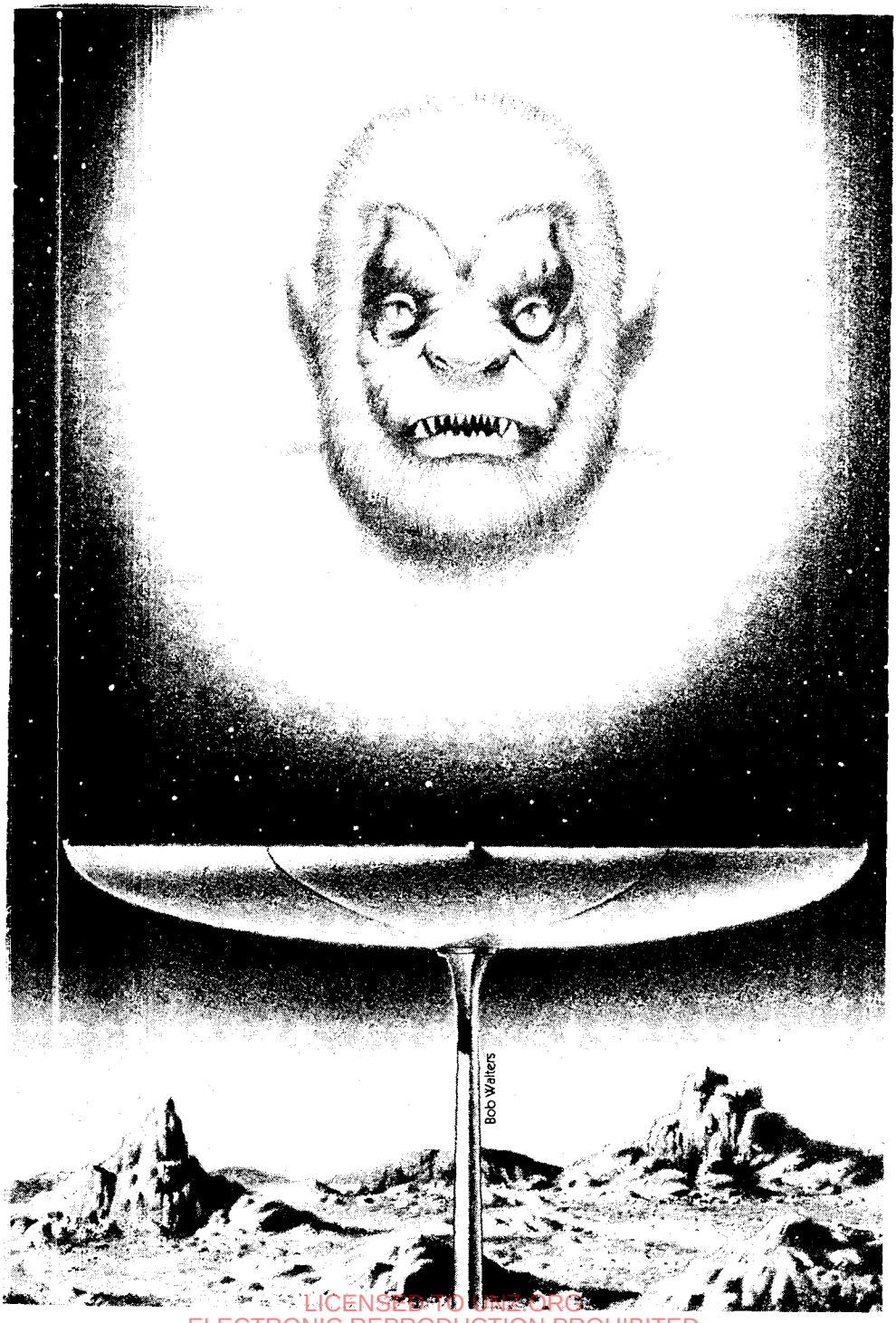

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They were intelligent, prolific, and savagely antagonistic to all life other than their own. If there is such a thing as racial insanity, they were its victims. They were also beyond cure.

Because of their anti-life crusade, their planet had become a sterile world of steel and concrete. Nothing swam in the oceans, walked, hopped, or crawled on the land, or flew in the sky. Even clouds were anathema; orbiting solar mirrors burned them away as fast as they formed. Nothing was allowed to contaminate the pristine purity of what they had created. Food, adequate but dull, was synthesized from raw elements. The oxygen in the air was replenished by fusion plants scattered around the ocean shores.

Already their ships were swarming between the thirteen planets and countless minor bodies of their solar system. In an accident rare in nature's lottery, a second planet had supported an efficient though primitive life ecology. But ships bearing radioactive dust had fallen like metal rain out of space, and within days not even a living cell remained. The race was thorough.

There was no doubt what the future held. They had studied the stars and were aware of the possibility of countless solar systems with life-bearing planets. It would take generations of course, but they were an immensely patient people to whom time was never an enemy. So the Great Work began.

Perhaps there really is no such thing as coincidence. Perhaps there is a higher power who keeps a fond eye on things, who knows the correct antibodies to introduce against any disease threatening the galactic organism. It is certainly true that, even as scientists of this mad race fiddled strings of mathematical formulae toward what was known elsewhere as the phase-shift star drive, an actual phase ship came undetected into their system. . . .

"Jase, you are to go to Phuili and take up the post of Resident Expediter in our legation there."

"But that's crazy! I'm a security agent, not an expediter!"

The shuttle was racing northward over the Canadian Shield. Rocks, trees, water, and sky were the prime components of this rugged land, one of the last wild places on Earth. Hopefully it would remain wild, now that Earthgate was open and the galaxy beckoned. Ahead, the spreading glint of Hudson Bay. On the horizon, beyond the large island known as Akimiski, something flickered. The P.A. cleared its throat.

"Transfer in four minutes. Please take your queltabs and make sure your seat restraints are secure."

The flickering had become a pulsating sphere of pale light. Just below it, something enormous.

"*I* know what you are. This desk and the four walls of this room know what you are. But to every human in the legation, and especially to the Phuili outside it, you will be an expediter. Anyway, what is so magical about expediting? It's more meditation than science, so you will be all right. Meanwhile, I want you to do your damndest to find out which of the legation staff is trying to screw up Earth-Phuili relations."

Director Kreinhauser of the World Union Council's Security Service was known as something of a hard-nose, a

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reputation which he himself had carefully fostered. The truth was that he was a gambler who so far had demonstrated an uncanny knack for holding the winning hand. But Jase Kurber, conscious of his own not-too-scientific background and more than a little doubtful of his ability to fool the dozen or so scientists who worked out of the legation, was convinced that this time the Director had gone too far. If I belly-flop on this one, Kurber reflected, it'll be more his head than mine. The lanky investigator popped the green queltab into his mouth, swallowed it with an effort, then braced himself as the thing sent searing waves of hot and cold through his system. *Damn gut convulser. This so-called cure is worse than the disease!*

The light, actually not much brighter than the background sky but somehow pulsing with a vivid contrast, now loomed a few kilometers ahead of the shuttle. Below the light, balanced delicately atop a frail looking pylon thousands of meters tall, was an enormous bowl with an inner surface of intense, mind-stunning black.

This was Earthgate.

Kurber had transferred often and was prepared. But even the easing effect of the queltab did not disguise the brutal wrench of splitting and reassembly which assaulted every nerve at the moment the shuttle entered the light. As his stomach unknotted and his eyes cleared, he became aware that the sky beyond the window was suddenly a much deeper blue. Then the shuttle shuddered as its jets roared and the wings extended to gain lift in the thinner air. Kurber's mind knew that within a breath the shuttle had somehow traversed six hundred light years, to a destination beyond the Pleiades. But even after having made the same trip a dozen times, his body and instincts still denied the fact. It was a normal reaction which he knew would be over within minutes. But he was also uncomfortably aware that of all the medical people who traveled through the gates into the galaxy, psychologists remained a stubbornly tiny minority.

The landscape below was all desert, varying shades of red splashed across flatlands and eroded highlands, occasionally fading to a dim fuzziness under the swirling sandstorms that were common here. This was a planet almost the twin of Mars; a dry and unprepossessing little world of a type common in the galaxy—big enough to have a tenuous atmosphere, close enough to its sun that its temperature extremes could be handled with only a modest technology, but not friendly enough to host even the most primitive life forms. Yet this was The Shouter, and a few kilometers behind the shuttle was Alien Artifact 6093, one of the remarkable structures which had given the planet its name.

A bowl two kilometers across, balanced atop a pylon three kilometers high. Above the bowl, a spherical glow radiating on frequencies that can be sensed clear across the spiral arm. And on this small world there are nineteen thousand six hundred and fifty-four AAs. No wonder it's called The Shouter!

The AAs were, of course, more than just monuments on a grand scale. Built by a mysterious race that had been old when the universe was still young, each of the gigantic structures was actually an instant portal to elsewhere in the galaxy, AA 6093 to Earth being but one.

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A few hours flight time around the curve of The Shouter was AA 11852, the portal to Kurber's ultimate destination on Phuili. First, however, was the mandatory stopover (for most of the shuttle's passengers) at the Colonization Authority's Reception Center. For Jase Kurber, it was at PERU, the Permanent Earth Research Unit on this way station to the stars.

Ninety minutes later, the shuttle rolled to a dusty stop on a hard-pack runway. Two pressurized buses instantly coupled to the hull and began to absorb its load of chattering colonists and their families. Their destinations, after processing in the Reception Center, could be any of nearly ten thousand worlds assigned for human colonization: from Hubris, a mere three hundred light years from The Shouter; to Farhome, a garden world thirty thousand lights beyond the hub. Not that it made any difference how far or how close. The mere act of walking the length of the shuttle's main cabin took more time than it did to transfer to the galactic rim.

Kurber had to suit up so he could be driven to PERU aboard an open six-wheeled vehicle that was definitely not intended for passengers. After loading half a dozen crates from the shuttle's hold onto the vehicle's flatbed, the taciturn driver accelerated in the direction of the blocky four-story PERU building as if his air supply were about to run out. His passenger—apparently just another package—was eventually delivered, flustered but unharmed, into the presence of PERU's Deputy Assistant Research Administrator.

"Sorry about that," Esham Pitte apologized after wincing at Kurber's blistering complaint. "Budgetary restraints have forced us to use Ph.D.s as errand boys, and one or two are quite hostile about the situation." He shrugged. "Truth is, the A.R.A.'s much better at soothing ruffled feelings than I am."

"Where is she?"

"With Peter Digonness on Van Buren's World. Something big, apparently."

"*Doesn't have to be that big to get those two together*, Kurber mused. The relationship between Genevieve Hagan and the former head of Expediters was well known. And, in the current situation, awkward. "Dammit, I have to see her!"

"I don't think so." The Deputy A.R.A. grinned. "You know, I am rather enjoying this. It's not every day I get the chance to assign a cloak and dagger man."

Kurber was too experienced to react to this unexpected turn. He merely propped his chin in one hand and inquired gently, "Oh?"

"I know you are an S.S. operative assigned to Phuili, that I am to use this office to give you legitimacy, and that I am supposed to transform you into the semblance of an expediter before the next Phuili shuttle leaves." Pitte glance at his watch. "Which is in about twenty-three hours."

"I see." Kurber paused for a moment, his thin face thoughtful. Then he shrugged. "OK, so you are my contact. As far as turning me into an expediter is concerned, is that so impossible? Some of Expediters' best people came from Security."

"One or two only. And if you have the example of Gia Mayland in mind,

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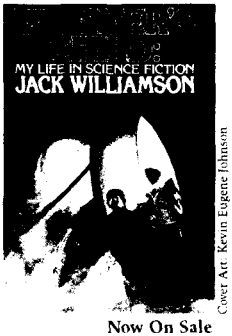

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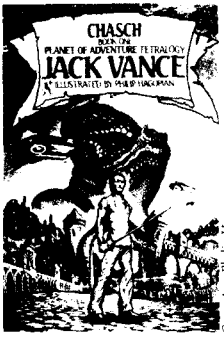

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you are barking up the wrong tree. Even she had to submit to a couple of years of field training after she transferred out of the S.S."

"Just do your best, huh?" Kurber asked, thinking of the woman who had gone from Security to Expediters, and then on to fame as the one who had opened up Earthgate and eliminated twenty-six dreary months of travel time between Earth and The Shouter. "Ah . . . I beg your pardon?"

"When were you last on The Shouter?" Pitte repeated patiently.

"About nine months ago. I was passing through from a job on Markov Four."

"Hmm." Pitte rubbed his chin. "That means there are a few still here who might remember you. OK, we'll conceal the truth behind a half truth—to the effect that you are following in Gia Maryland's hallowed footsteps from Security to Expediters. You are still a trainee of course, which explains your lack of experience. How am I doing?"

"Pretty good," Kurber said, surprised. "Is it possible you yourself came out of Security?"

Pitte sighed. "You don't have to go that route just to learn deviousness. I can hardly remember the time when an expediter's job was simply to 'expedite' communication between scientists of varying disciplines. Now we are also required to function as diplomats and lobbyists, as well as paper shufflers. It's one reason why Peter Digonness got himself assigned to Van Buren's World, and why Jenny is with him right now. Those two are pretty close, you know."

"So I have heard." Digonness and Genevieve Hagan were famous for their role in the discovery of the purpose of the AAs, and for many people they still exemplified the true meaning of expediter. Kurber was beginning to realize this was one role he would not find easy. "Perhaps it would be better," he said, "if you simply gave me a few pointers on how to expedite."

During the next several intensive hours, as the Deputy A.R.A. drilled him on the history, objectives, and procedures of Expediters, Kurber began to understand the frustrations of those who currently belonged to that organization. Originally a communicator, with enough basic knowledge of several scientific skills he could meld a quarrelsome mix of specialists into a coherent scientific team, the typical expediter was now—as Pitte had sadly pointed out—anything but. The idea behind Expediters had been a good one, and indeed the demand for its services was as strong as ever. But science as now taught in Earth's schools was not as parochial as it used to be, and the current crop of graduates did not need middle men to help them interact constructively with each other. But they still seemed to need someone through whom they could interact with the 'outside' world; especially if that someone had the ability to be as much at home with a research project on the far side of the galaxy as he was seeking increased grants from politicians, or peacemaking between man and Phuili.

The canine-like Phuili had already been on The Shouter for centuries when the first human ship ventured out of the Pleiades shadow and detected the screaming radiation source a couple of hundred-lights beyond that nebula-hazed star cluster. Fortunately the Phuili were

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From America's #1 Financial Adviser

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by nature an obsessively curious people, so they allowed the setting up of a human research station on The Shouter so that their own scientists could in turn study these clever primates. Instantly, the issue of human "intelligence" became a controversial one, cutting to the heart of the mystical concept of Phuili exclusiveness in the galaxy. The result was a schizoid compromise in which individual humans were accepted as equals, while humanity was condescendingly regarded as a lesser species which happened to have an unusual aptitude for technology.

The potential for conflict was consequently a factor from the beginning, setting human pride and assertiveness against Phuili pride and conservatism. But those who had created the AAs — though long departed from the physical universe—reached out from across eons of time and an infinity of distance, to nudge the two species toward a kind of awkward compatibility. It was understandably a precarious relationship, resting uneasily on a sub strata of bigotry and mistrust. Nevertheless, among individuals of both species, there developed a reluctant realization that in many ways human and Phuili complemented each other; that as far as the exploration of the galaxy was concerned, the sum was showing evidence of being greater than its parts.

But there were those, human as well as Phuili, who remained implacable in their hostility to the infant duality. Hence the reason for the increasing diplomatic role of Expediters, the only human organization having enough influence with high-level Phuili to prevent minor grievances attaining crisis proportions. But in cases involving deliberate trouble-mongering, diplomacy as a healing process could not be applied until the cause was expunged. "Which," Jase Kurber explained, "is where Security comes in."

"Comes in for what?" the Deputy A.R.A. asked, puzzled. "What is happening on Phuili anyway?"

"Are you familiar with a publication called *Universe Realities*?"

Pitte nodded. "I've heard of it. Makes the Jew-hating propaganda of Hitler's Nazis seem amateurish."

"Translated copies are currently being circulated on Phuili."

"My god." Pitte's eyes widened with shocked disbelief. "How the hell did that happen?"

"It's easy if you consider that one microchip can hold the text of a dozen issues. Someone in the legation is smuggling the chips in from Earth, then passing them on to a Phuili group with the rather unsubtle title of 'The Human Eaters.' The Eaters in turn handle read-out, translation, and distribution. The poison is slow-acting, but it is apparently working. If it is not stopped, and damn soon, Earth-Phuili relations are going to be right back to square one."

"Talk to the leaders—"

"We have. And we think they understand. Trouble is, they are bound by a code which was old when our ancestors were still huddling in caves. According to that code, any form of slander against their ancient society is what they call a 'supreme crime.' I'll leave you to guess what the punishment is. At the same time, however, the Phuili are solemnly committed to the protection of human lives and property on their world.

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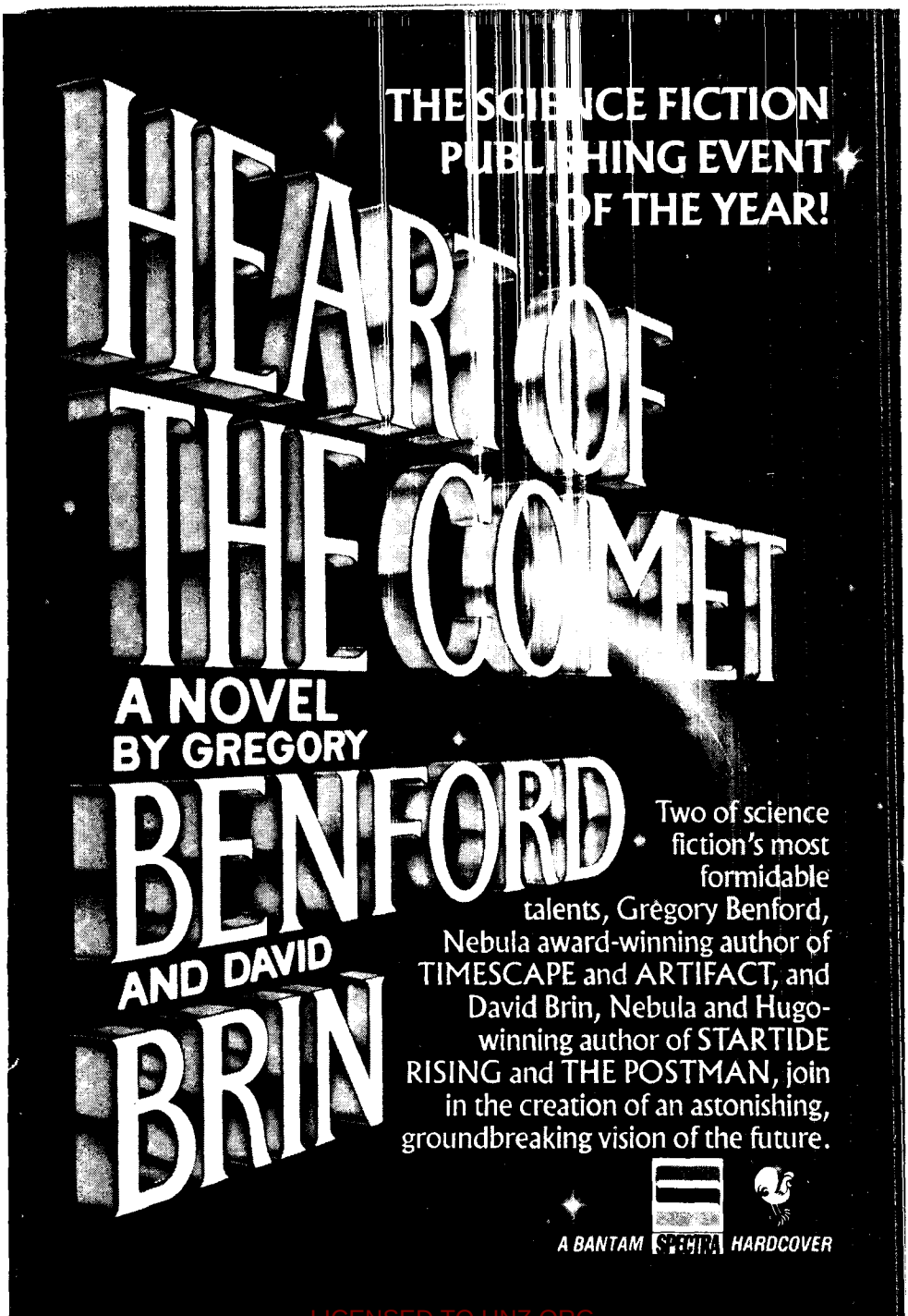
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The dilemma for them is obvious, and ultimately has only one solution."

"Kick all humans off Phuili."

"Exactly. My job is to find the mole and get *him* off Phuili while there is still time to defuse the situation. I can't go in as a cop, because he will simply suspend operations until after I have gone. But if I am just another expediter. . . ."

"Give me your ident," PERU's Deputy Assistant Research Administrator said. He accepted the small disc and handed over another. "I guess we're one up on you, friend. This was coded directly from Earth even before you made the transfer." He smiled and extended his hand. "Jase Kurber, welcome to Expediters."

Sensors extended and computers humming, the ship floated inert in the ring system of the sixth planet. Within the long hull, beings known as Phuili studied the incoming data with emotions ranging from excitement to apprehension. The presence of intelligent life in this system was obvious, the advisability of contact not so. There was a strangeness about this new race and its swarming ships, about the slagged planets, moons, and asteroids that were being exploited with ruthless abandon.

Increment by minute increment, the visitors were painstakingly deciphering the signals being exchanged between the smog-shrouded second world and the hundreds of outposts scattered throughout the system. There was frequent reference to the "Great Work," a mysterious activity somehow tied in with the mad plundering of the system's resources. There was statistical information, dealing with mundanes such as shipping requirements and production quotas. At no time or on no frequency could the Phuili detect the subtleties of culture or entertainment. Not even messages from home—those tenuous links of personal contact surely so necessary for warm blooded beings with roots in the soil of a home world.

The Phuili were uneasy, especially as they garnered further disquieting facts from the remains of a big brained, silver furred, and undoubtedly warm blooded biped they had retrieved from the wreckage of a small spacecraft on a nearby moonlet. To the logical Phuili, the contrast between this graceful being and its compact, efficiently designed spacecraft on the one hand, and the senseless rampage of its species through the system on the other, was too much akin to a flawed computer program which defied analysis.

There was menace here; subtle, unexplainable, yet as real as a slumbering carnivore. So the visitors withdrew to the edge of the great dark, where they prepared their ship for phase-shift into multilight.

But only milliseconds before the PS drive unleashed the tremendous energies necessary to thrust the ship and its contents beyond the constraints of normal spacetime, one of its hull sensors detected and recorded an event near the second planet. . . .

Welcome to Expediters, the Deputy A.R.A. had said. A happy if not unexpected phrase to the ears of one who has spent years preparing for the great moment. But Jase Kurber was not one of those: the plan had merely required

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that he act like an expediter—not actually be one!

He snapped the ident disc out of his wrist bracelet and looked at it. A small marvel of technology: imprinted with his personal history, health status, retinal identification patterns. And now his membership number and classification in Expediters. The situation on Phuili had to be drastic for Security and Expediters to go to such an extreme. Ident discs were sacrosanct, guaranteed and accepted by every military and law agency in human space, and they were not changed easily. In fact, they were hardly changed at all. No temporary expedient, this. Kurber was, now and for the foreseeable future, an expediter.

How did they get Kreinhauser to agree to it? the former security agent wondered. Some pretty persuasive arguments must have been used to get the old Director to agree to the permanent transfer of one his own to a rival agency.

How do I feel about it?

Actually, not bad. Despite Pitte's lament about how things had deteriorated since the old days, Expediters remained a prestige outfit right out there on the cutting edge of human progress. Nevertheless, Kurber felt an uneasy twinge as he thought about the humans on Phuili who would undoubtedly seek his "special" talents. And which of them was the mole? Though he had been briefed by Pitte, those people were still only a collection of names to him. All seemed competent in their field, none was extraordinary enough to stand out —which, of course, a good mole never does.

"Entry in two minutes," the P.A. said. Kurber glanced through the shuttle window at the rapidly advancing outline of AA 11852, popped the queltab, and braced himself. Later, as his insides rearranged themselves back to normal and his eyes cleared, he looked down on a broad blue-green plain and a city. He had barely time to notice the almost mathematical regularity of the city's alternating rings of towers and parkland before the shuttle banked steeply and glided to a gentle touchdown on a broad, smooth runway.

As soon as they stopped rolling, a ground tug hooked on to the shuttle and towed it alongside a pill-box shaped structure rimmed with circular ports. A boarding tube extended from one of the ports and thumped against the hull at the forward air lock. After a few seconds the inner door swung open and a thin, harried-looking human entered. "I am Barton Hale from the legation. Please follow me." Without waiting for a response the man disappeared back into the tube. The shuttle's eleven passengers obediently lined up and shuffled after him into a circular room about five meters across. The walls and floor of the room were heavily padded.

"You are aboard a car of the local sub-surface transport network," Hale announced. He was sitting on the floor, his back pressed firmly against the wall padding. "It is not a gentle ride, so I suggest you all assume this same position."

With varying degrees of difficulty everyone accepted Hale's advice, and hardly had the last one—a plump diplomat in an old-fashioned jumpsuit —groaned himself down, when the floor abruptly fell away from beneath them. After about five seconds of head-

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long descent, the vehicle decelerated, rotated, then surged in a horizontal direction. Kurber sprawled against his neighbor, who laughed and pushed him upright. "Is this your first time, Mr. Kurber?"

He looked at her. In her early thirties, neat and slim, with wide-eyed almost elfin features, she was not the type one would easily forget. "Do you know me?" he asked.

"Of you," she corrected. She held out her hand. "My name is Gia Mayland."

Her handshake was firm, impersonal. "Well I'm damned," Kurber said. Then he laughed. "I'm sorry. Honest. I won't ask for your autograph."

"Good. And I won't volunteer it," the woman once popularized by the media as the "Earthgate girl" replied. She went on, "I understand you recently saw our former boss. How is the old gentleman these days?"

"Fine," Kurber replied, wondering how much she knew. "He . . . ah . . . sent you his regards."

"I doubt that," she came back primly. "Director Kreinhauser was not exactly pleased when I told him I was transferring to Expediters. And now that you have followed along the same course, I doubt he likes you either."

Kurber was beginning to feel like an actor who had been thrown into a play without first seeing the script. "Yes, but I—"

"It's a bit unusual for one with your lack of experience to be assigned to an important post such as Phuili, but I'm sure you can handle it. In any case I will be around for a while, and will be available if you need me—which I hope you won't. I am not on Phuili to expedite."

Because she was speaking in a conversational tone, audible to any of the others aboard the vehicle should they choose to listen, Kurber suspected Gia Mayland was not talking to him alone. She seemed, in fact, to be cleverly reinforcing his cover as the new Resident Expediter, though that was hardly proof she knew the real nature of his assignment on Phuili. "Why are you here?" he asked. "Or isn't that a proper question?"

She shrugged. "I'm here to renew a friendship. A Phuili I once knew as David."

"David?" And then an explosion of consonants: "Davakinapwottapellazanzis?" It was the plump diplomat, bearing a look of smugness on his apple-cheeked features as he came over and settled his broad rump next to Gia. "Forgive an old man's intrusion, but I know David quite well. In fact, it is because of his tutoring that I may be the only human alive who can properly pronounce a Phuili name."

"True enough," Gia agreed. "But who cares?" She turned to Kurber. "This rather large gentleman is Mason Dewitte, the legation's trade specialist. Mason, this is our new R. E., Jase Kurber."

"Splendid." The fat man beamed at Kurber. "And don't worry about your lack of experience, young man. The people here get on very well together, so I doubt there will be much demand for your services."

"That is nice," the recently appointed expediter commented, unsure if he should be grateful or disappointed.

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"We're almost there," Hale called. "Brace yourselves." The vehicle shuddered, swung about, and then shot vertically upward. As it lurched to a stop, the padded entrance door slid aside to reveal a concrete walkway rimmed with slender, spike-leafed trees. The outside air was cool, damp, and so unpleasantly pungent it caused several people to gasp. "You'll get used to it," Hale said cheerfully. "If it's any consolation, the Phuili find Earth's air equally offensive."

The legation was housed in a modest tower behind which other towers rose in serried ranks against a sky that was a paler blue than Earth's. Though the Phuili did not seem to have much use for windows, the skyline was not unlike that of many modern cities Kurber had seen. The only obvious difference was the lack of noise. They could not even hear their own footsteps—the "concrete" walkway had a gentle resilence like good turf. So it was almost a relief to enter the comfortable human environment of the legation, to view the uninspiring furniture and decor of the entrance lobby.

A prim-faced woman appeared at Kurber's side. "Are you Jase Kurber?"

"That's right."

"This way, please."

"See you later," Dewitte called as Kurber followed the woman across the lobby. He looked around for Gia, but she had already disappeared. He was shown into a small room containing nothing but an ident unit on a small table. "Disc, please," the woman said.

So that's it! How the Phuili legation had suddenly acquired this Pri-Al classification was a mystery, but it did explain why a mere impersonation would have bounced Kurber back to The Shouter even before he had a chance to draw breath. He fingered the release on his bracelet. "Isn't this a bit unusual?"

"It is required." The woman held out her hand. "That is, if you do not wish to return on the next flight."

Kurber chuckled as he handed over the I-disc. "Succinctly put." He leaned over the machine and peered into the eyepiece. There was a wink of light and he stood up. Then the woman slid the disc into a slot at the side of the machine. A light flashed green, and then another.

The woman returned the disc and watched as he snapped it back into the bracelet. Her lips twitched as he asked politely, "So my particulars check out, huh?"

She pointed to a door on the far side of the room. "You will wait in there." The twitch became a stiff smile. "Please."

Feeling he had made a conquest of sorts, Kurber smiled back. "Of course." Then he entered the next room.

He was not overwhelmingly surprised to find Gia Mayland waiting for him there. But it required a trained reflex of dead-pan as he saw her companion.

"Gweetings, Kurber," the Phuili said.

The being was a little more than a meter in height, humanoid, with a pink-fleshed canine head which reminded the man of the bull terrier he had grown up with as a child. Large, beautiful eyes regarded the newcomer quizzically. "Pleese to sit," the Phuili invited.

Kurber sat, with a side glance at the woman. She smiled encouragingly.

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"I am David," the Phuili said. "Once I work wiz Gia when we look for gates."

"Ah. You are the one who knows Mason Dewitte."

The long head inclined. "He zink he know how speak Phuili."

Recognizing sarcasm, Kurber wanted to laugh. Instead, "Why am I here?"

"About weason you come to Phuili. About need to stop bad information going to Human Eaters."

Again, Kurber looked inquiringly at Gia. "There are no secrets here," she told him. "David and I know you are on Phuili to smoke out the human who is causing this trouble."

Helplessly, he looked at the two dissimilar individuals. "But why me? Gia, you are ex-security—"

She laid her hand on his arm. Her touch tingled. "Aside from being out of practice, I am also too well known." Suddenly, a brilliant smile. "Besides, you happen to be good. If I had remained with the outfit, I don't doubt you would have been my sector chief by now."

Kurber frowned. "I am an expediter. I take that seriously."

"So you are—and should. But you should also know that it was Giesse Frobert who clamped Pri-A-one on this legation. The matter is serious, Jase. More than you realize."

Kurber was astonished. The Chairman of the World Union Council was known for his disdain of anything other than what he constantly referred to as "the larger picture," so he would hardly have intervened unless it involved far more than even a threatened debacle on Phuili. "Look, I understand how damaging the material from *Universe Realities* is to Earth-Phuili relations. But enough to get the Chairman involved? And why Pri-A-one anyway? There's no—"

Gia said, "There is another space-going race."

Kurber stared. *So it has finally happened!* "My god," he whispered. Then, "Has there been contact?"

"No. And we pray there will not be." Gia turned to the Phuili. "May I tell him? Time is limited, and we do share a common tongue."

The Phuili said gravely, "You tell. It best he know pwoper."

"Thank you, David." Gia produced a photograph of a graceful, silver-furred humanoid. The skull was obviously crushed, but enough remained to indicate a brain case of impressive proportions. "Pretty, huh? He was found by a Phuili expedition operating out of Groombra Four, about two thousand lights rimward. Millions of those beings are swarming about their solar system like maggots on a corpse—literally devouring everything from dust up to planetoids in an apparent lust for astronomical quantities of raw materials."

"Materials for what purpose?" Kurber asked, his attention diverted from the picture.

"God knows. The Phuili commander sensibly decided to pull out before he was discovered and wiped out. You see, enough had already been deciphered from the local radio traffic to determine that this new race represents a threat of awesome significance." Gia tapped the picture. "Jase, these lovely beings are anti-life!"

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"It iss zeir holy mission," David explained, his alien features intent and solemn. "To zem, life not zeir own must be destwoyed. Alweady zey have stewilized zeir own world and anozer which once had life. Soon, zey look to stars."

When he was only five years old, Jase Kurber was accidently locked in an unlighted basement for more than seven hours. He had not thought about it for years, but suddenly it was there like yesterday—a child's eternity during which he cowered in a corner and waited for unimaginable things to erupt out of the dark. Now, from the greater dark. . . .

Kurber sternly quelled his racing imagination and commented reasonably, "Looking to the stars is one thing, getting there is another. Neither of you has said anything about their having that kind of capability."

"Jase, what do you know about the history of the P.S. drive?" Gia asked.

"Other than that it was a long and very rocky road between theory and practice, not much," Kurber replied, wondering what this was leading to. "I know there were some pretty spectacular accidents along the way, including the addition of a fair-sized crater on Luna farside." His eyes widened. "Wait a minute—are you telling me such an event was observed from the Phuili ship?"

She nodded. "A burst was detected just before the ship phase-shifted. What it signifies is not definite of course, but it's a pretty strong indication."

"A bloody powerful one, if you ask me," he muttered.

"So now you know why your assignment here is so important. The Silver People have to be stopped before they start, Jase, which certainly won't happen if we and the Phuili are squabbling with each other instead of acting against the common threat." Gia added passionately, "The supplier of that xenophobic garbage has to be found and neutralized!"

Where to start?

There was no doubt there was open resentment at the presence of humans on the planet, but that was nothing new. Phuili life was largely ritualistic, based on a complex set of rules in many ways similar to the Jewish *Talmud*, though much older and certainly more extensive. Add a class structure even more stratified than the ancient Hindu caste system, and the potential against the free-wheeling humans was not only explosive but increasingly probable—as Kurber was reminded each time he tried to leave the legation on his own.

Mason Dewitte explained, "Old hands like myself must always be present to make sure nothing is said or done to offend any of the local people, while at the same time we expect the newer ones—like yourself—to perhaps recognize openings that in our caution we may have overlooked." The fat man had joined Kurber on one of the latter's first excursions into the city, a rather obvious chaperoning which Kurber accepted only because he had to. Dewitte continued, "It's like a sparring match with the other side having all the advantage: their rules and turf, our ignorance. Up to recently we humans seem to have held our own, but with that crud from *Realities* seeping in—"

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"I heard about that," Kurber said cautiously. They were crossing an open area in which booths were set up in the manner of a street market. Buyers were circulating about in abundance, but there were no sellers. Instead, purchase seemed to be a matter of selecting an item, looking at its price, entering something into a counter-mounted keyboard, and then walking away with the item. It was an awesome display of honesty which further emphasized the gulf between Phuili and human. Equally disquieting was the lack of sound to accompany the visual bustle; an occasional Phuili guttural only intensified Kurber's sense of being a male Alice in an unreal wonderland. He winced as a Phuili family—an adult and two smaller ones —hurriedly moved away as the humans approached. "Did you see that?"

Dewitte nodded. "Sub Elites." He indicated the bright colors worn by the three. "I guess you'd call them upper-middle class. Moderately educated, economically comfortable, stalwart adherents of the ancient traditions. If they get stirred up enough, they are the ones who will get us kicked off Phuili—and the Elites won't argue."

"Elites?"

"The top brass; scientists mostly. Great theoretical people but slow on application—which is hardly surprising if you consider the built-in inertia of this ossified society. I suppose that is why the Elites are so uncharacteristically garulous when they are dealing with us humans; our constant adaptation to technological change must be pretty startling by their standards. David is an Elite of course, as are most of the Phuili you will meet. Nominally they rule, though always *by* the rules. The Subs make sure of that."

"Elites, Sub Elites. Then what?"

"Everyone else. The proletariat or 'prols' if you prefer. Generally they are not too bright, programmed to a hereditary trade, conditioned to acceptance of their lowly lot. The most stable labor pool you can imagine."

"So the Czar thought before nineteen seventeen."

"Not the same, my boy, not at all the same. You see, on this planet there is no cross-class migration. None! Over hundreds of generations, the Phuili have consequently evolved to fit their roles —mentally as well as physically. The Elites have evolved brain power, the Subs evolved into natural administrators, the rest into machinists, farmers, shoe makers and so on. It's a helluva system, Jase, and until we humans barged into their universe, it was one that worked."

Implying, Kurber supposed, that the mere presence of humans had thrown a wrench into the machinery. But as he continued to watch the activity in the market, he somehow doubted that. Every Phuili in sight was, in fact, going about his business as if the two beings from another world did not exist. For Kurber it was not a pleasant experience to be so thoroughly ignored. The reaction of the three Subs, who had shown their dislike of the humans in the most obvious way, was at least understandable. But the absolute non-reaction of these others. . . .

He stepped aside as half a dozen of the drably clad prols passed close by, their large eyes blank and unwavering. Dewitte chuckled. "Don't worry, they

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won't walk over you. They are simply ignoring what they don't understand. In their well-ordered little minds, humans don't compute."

Kurber looked at the other sharply. "You speak as if they are biological robots."

The fat man shrugged and did not comment. But his silence said enough.

It was clearly apparent that Kurber had to be far more than just a tourist to unlock the Phuili enigma. Gaining the confidence of the "natives" was not in the cards for any human, at least not for the immediate future. Certainly the enormous bottom tier of the Phuili hierarchy did not care; for that ninety-five percent of the population, what humans did, said, or wrote simply did not matter. The "flat faces" were entirely peripheral to the scheme of things. Like the stars from which they had supposedly come, their effect on the ancient routines was no more than a container of water spilled into the ocean.

Conversely the Elites knew what was happening, and cared. But in their way they were as much bound by tradition as the masses, and would have no hesitation in ordering the humans off Phuili if the Subs demanded it.

Which, like an endless circle, always brought the problem back to the Sub Elites. Jealous guardians of the Phuili universe, their only reason for not objecting to the establishment of a human legation on Phuili was simply a restatement of the principle: "the devil we know is easier to handle than the one we don't." The extremists among them, since being formally established as the "Human Eaters," had of course gladly accepted the opportunity to circulate translated copies of the Earth publication *Universe Realities*, to prove beyond doubt what most Subs wanted to believe anyway—that humans and their inferior ideas represented an evil which had to be expunged, starting with the removal of every flatface from Phuili itself.

For once, the massive inertia of Phuili society was beneficial for the beleaguered humans; what had already been accepted would be difficult to turn around. But unless the flow of Earth-originated hate propaganda was stopped, what had at best been reluctant acceptance would inevitably degenerate into active hostility—and the malevolence currently germinating around a distant sun would, in the perhaps not too distant future, extract a terrible price.

Gia read, " 'All thinking beings will protect what is theirs. OK, that is natural for anyone with the concept of personal property. But what if that property is in dispute? What if one party has arbitrarily declared that *all* property is his, who refuses to change his mind even after another legitimate claimant comes on the scene?

'I am, of course, referring to the Phuili. You all know that. They maintain that the galaxy is theirs, that we humans are a lesser species who happen to live on their property. They find us interesting in a condescending sort of way, they even humor us by permitting minor scientific and diplomatic exchanges. But they also study us; intently. And when they finally realize the truth—that we humans are not only equal but are perhaps a superior species, they will act. They will attempt to destroy us!

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'My friends, I hate to use the term "pre-emptive strike." It has too many ugly connotations from our turbulent past. But I do say we must prepare for the worst, that when the attack comes—as it must—we will be in a position to give the dog-faces a lesson they will never forget!' "

Gia disgustedly tossed the sheet aside. "And so it goes on, ad nauseam. Lector Fraser, number one bigot, recorded verbatim within the doting pages of *Universe Realities*."

"Which he owns." Kurber looked at the sheet of paper on the floor with distaste. "Is it all like that?"

"Not all the time. Sometimes the lord and publisher of that muckrag sounds forth on his second favorite subject: creationism. I remember one issue in which he used only a few thousand words to say that man, being the exclusive creation of the Supreme Being, is therefore destined to occupy the universe."

Even David recognized Gia's sarcasm. "Same wiz Human Eaters." Sadly, he shook his long head. "Iss why some alweady pweach Jihad."

Startled, Kurber looked at the little alien. He did not know how David had picked up the Moslem word for holy war, but neither did he think to question its use. He had learned enough to be quite certain the Eaters would sacrifice themselves as well as half their world if they could be sure those who were left would resume the purity of the old ways. The same was probably true of the fanatics who belonged to Lector Fraser, though because of the diversity of human society. . . .

Kurber had an idea. "David, can you take me to the Human Eaters?"

The reply was prompt. "Not possible. Human Eaters not talk wiz humans."

"Then how do the *Realities* chips get to them?"

"Ozer Sub Elites make twansfer."

Gia nodded. "None of the Subs like us, but a few occasionally have business at the legation."

"Then assemble those few for me. I bet at least one will be a contact."

"What do you have in mind?"

"Communication," Kurber said.

"Zey must be stopped before weach gate on Toomis."

"Toomis?"

"What humans call Gwoombwa Four. Light twavel fwom zeir system, forty year."

"That close? That's only six weeks with a P.S. drive!"

"Iss twue. Zey not yet have phase shift, so still westwicted to zeir own system. But our ship see one P.S. expewiment, so I zink not long to first star ship."

"If they find that gate and figure out its function—"

"Many die. Worlds die."

"So we stop them. Do you know how?"

"Wiz sun seeds."

"Sun seeds? What. . .?"

"Known by Phuili long time. Two pwobes dwop into sun. First twigger weaction under photosphere, vewy big flares. When weaction at peak, second pwobe make sun nova. Not big, just enough destwoy life on close planets. Outer colonies die wizout support fwom home world."

"My god, what a weapon!"

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"But must done quick. Human Eaters gwow stwong, soon not allow work wiz humans."

"Anything to stop that madness escaping into the galaxy! What do you want from us?"

"Two human ships and cwews. Ships go Toomis gate and zen to sun of Silver people. Dwop seeds and come back."

"I don't understand. Human ships—"

"Destwuction of whole wace not possible for Phuili. Humans have big wars. Easy for you."

"Like hell it is! It's because of those big wars and what they did to us, no government would dare even to consider such a thing! Anyway, we honor our treaties. What happens in that area of space is strictly a Phuili affair."

"In zis case, not twue."

"Oh, I think so. You see, I was at the signing. Only Phuili. . . ."

"Only human. . . ."

"No. . . ."

"No. . . ."

Kurber had not heard of the deadlock, only that high level discussions were being held on The Shouter. But even if he had, his approach would not be any different. The menace of the Silver People was still in the future; the widening schism between Earth and Phuili was now.

He had already spent a couple of monotonous days studying the legation's personnel records, solaced by the occasional presence of Gia Mayland who had somehow obtained the printouts without arousing the suspicions of the dragon lady at the front desk. Not that the records, despite their considerable content, told him anything beyond what he had already learned from Esham Pitte's briefing during the stopover at PERU. Seventeen people from varying but unstartling backgrounds, individualists, healthy extroverts, each extremely good at his or her specialty, none with apparently the slightest reason to want to upset the delicate status quo which existed between the two races.

Aware that even during quiet times an expediter was supposed to remain visible to his potential clients, Kurber made a point of taking his meals in the small dining lounge, sharing complaints at the uninspiring quality of the prepackaged food, and sympathizing at the frustrations caused by the agonizing slowness of the local Phuili bureaucracy in answering requests to travel beyond the city.

Gia reacted with a smile when he told her about the frustrations. "Jase, you are the Resident Expediter. So why don't you expedite?" Then, seriously, "But you have other things on your mind. I will take care of it."

Two permits arrived within hours, and Kurber had to hide his embarrassment as the grateful recipients thanked him. Would they be as friendly if they knew how much he was into their professional and private lives, he wondered? Then he castigated himself for dwelling on irrelevancies. Other than Kurber himself, there was only one person attached to the legation who was not what he—or she—seemed to be, and that individual was buried so deep under one of seventeen increasingly familiar personae. Kurber was seriously beginning to doubt his chances of being able

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to identify the culprit by any conventional means.

So it was a relief when he answered a call within his quarters and heard Gia say cheerfully, "Remember you told me you would like to see a typical Phuili home? Well, it has been arranged. David and I will pick you up in one hour."

Kurber had not made any such request. But he had no difficulty translating, *"We have set up a meeting with the Subs. Coming?"*

"Great," he answered. "I'll be ready."

When he entered the lobby an hour later and found Gia and her Phuili friend chatting with Mason Dewitte and the prim receptionist, it seemed so innocent that for a moment he wondered if he actually had asked to meet a Phuili family. But as soon as they left the building and climbed into a Phuili ground car, he knew immediately this was not to be a social call.

"Three Subs are waiting for you in a residence unit a few klicks from here," Gia told him as David steered the low slung vehicle into an automated laneway which led directly toward the towers at the city's center. "We suspect at least one of them is a link between the legation and the Human Eaters, though if you challenge them with that possibility I doubt you will get any reaction other than a polite silence. Believe me, these people are conservative in a way that make our right-wingers look like Marxists."

"My mind is already made up," Kurber quoted. "So please do not confuse me with the facts."

"You have hit the nail on the proverbial head. And by the way, Jase, don't let on you are anything other than an expediter. If word of this meeting gets back to the legation—as it probably will —you are simply using your position as R.E. to try to counteract the effect of damaging, Earth-originated propaganda."

Kurber chuckled. "Don't worry about that. One thing I like about this assignment is that I *am* an expediter. So what is there to hide?"

Gia frowned. "You know what I mean," she said crossly.

It was an uncomfortable ride, sitting knees-up in a vehicle designed for riders the size of human children, so Kurber was not fully attentive to the passing scenery. But he did comment on the scarcity of street traffic.

"Day of Unforgetting," David said. "No work, people stay home and zink of Phuili way. Happen everwy twelve-day."

Gia explained. "It's the equivalent of our Sabbath, a sort of rededication using a common set of rituals at the same day and hour, all over the planet. It hasn't changed for thousands of years."

David nodded as he turned the vehicle into a parking area next to a slender tower. "More zan knowing." He added flatly, "Iss!"

One monosyllable encompassing an entire racial philosophy, though it took a few minutes—the time to reach a dim room on the tower's ninety-third floor —for Kurber to realize he had just heard the hard-core difference separating his own race from that of his small host. Belief, as humans know it, is a transient thing; gods became God, Zeus became

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Yahweh, unthinking subservience to invisible spirits became that modern copout known as agnosticism. Not so for the Phuili. For them, what had started as belief had with time hardened into fact, and as the centuries and then the millennia rolled by, into a knowledge literally encapsulated within the genes.

Realizing the impossible task he had set himself, Kurber wished he could exit the cramped elevator and even the planet, perhaps to find a place where security was the responsibility of the sheriff and where expediting was something done by the local mayor. It was too late for that of course, much too late. So as he entered the dim room, it was with a certain grim determination.

The three Sub Elites were sitting behind a low table at the far side of the room. Introducing them as Paul, James, and Edward, David said, "I twanslate," and also sat at the table. David's one-piece garment of soft gray was in dignified contrast to the garish colors worn by the Subs. Also noticeable, even in the sudued light, was the fact that compared with his compatriots, David's head was longer and his skin of a lighter shade—seemingly further confirmation of the evolutionary divergences wrought by this rigidly ancient culture.

Gia whispered. "It's your party, Jase."

Kurber shuddered. "I know." What followed, though not entirely fruitless, proved to be one of the most difficult interviews of his experience. Speaking through David, the three Subs could just have easily been one.

"I understand you all regularly visit the Earth legation," Kurber began.

"Yess."

"Also that you know of the bad writings which have been obtained and circulated by the group known as the Human Eaters."

"We know."

"Will you please tell me which of the humans brought those writings to Phuili?"

"No."

"I know the Human Eaters have no direct dealings with any human, so it has to be another Phuili who receives the microchips and delivers them to the Eaters. Is that Phuili one of you?"

Silence.

"Then I will examine the legation's records to determine which of you has the least reason to call there."

It was a long shot, and for a moment it seemed that the one known as Edward had shed his apparent indifference enough to betray a nervous tightening of his jaws. But in the bad light it could also have been a trick of Kurber's imagination, so the man continued.

"Actually it is not important which human and which Phuili is involved in this matter. What is important is that all the Phuili recognize the writings for what they are; the rantings of one human who certainly does not represent his kind. As a people we do *not* believe the Phuili are any threat to us, and we know we are not a threat to the Phuili. Neither does humanity and its leaders have any kind of plan to rule the galaxy. Such an idea is absolute nonsense, and can only be the product of a sick mind."

The reaction was immediate. "What one Phuili say, all Phuili do. What one human say, all human do. One sick, zen all sick. Human wace dangerwous. All

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must go back home planet fwom Phuili and Shouter. Phuili make galaxy safe."

The statement was so outrageous that for a moment Kurber was at a complete loss for words. Counter arguments raced through his mind, including the one in which he would describe the incredible variety of the human species; from Pygmy to European, Marxist to Monarchist, Technocrat to Mystic. But remembering a remark of Mason Dewitte, Kurber was quite sure anything he said would be rejected by the inflexible Subs because it "does not compute."

Damn you, I'm not done yet!

Kurber took a deep breath. "What about the builders of the A.A.s? Where do they fit into your scheme of things?"

The reply was bland. "Zey gone long time. Galaxy Phuili now."

Kurber felt he would strangle. Gia sensed the pent-up pressure and laid a hand on his arm. "It's not worth it, Jase. Don't play into the hands of the Eaters."

She was right, of course. Kurber took several deep breaths, letting the tension drain from him with each expelled lungfull. "I think we had better go," he said.

It was only a straw, yet it was all he had. Kurber spoke about it as the still apologetic David drove them back to the legation. "Those three don't like humans, yet they were willing to talk to us. On the other hand, the Human Eaters feel soiled even if they see a human from a distance. Doesn't that suggest the Subs are not such a homogenous group after all?"

"It only suggests they are not machines, Jase." Squeezed beside him in the ground car, Gia was an attractive antidote for Kurber's depression. "Sure there are differences, though nowhere near to the same extent that we have on Earth. In fact, it is that fine balance between the Phuili norm and extreme which makes the *Realities* material so dangerous. In this society, push can all too easily become shove."

The sky was fading into evening. Ahead, the more modest towers of the city's perimeter were hard-edged shadows against a pink sky. In many ways Phuili was an attractive world, and now that Kurber's nose was becoming adjusted to its strange odors, he thought he understood why most of the humans stationed here were into their second two-year terms.

David had remained uncharacteristically silent as he guided the ground car through the darkening and silent streets. But the continuous flexing of his large ears indicated he was listening closely to the conversation of his human companions. He finally broke silence as they turned into the legation's approach lane. "Iss vewy bad. If Subs invoke law, Elites must go wiz same. Only way is for bad information to stop."

Sorry guys, it's in your court now. I sympathize, but the law is God and God is the law. So what can I do?

Not much, Kurber supposed bitterly, his brief consideration of the attractiveness of this world evaporating under a surge of anger. Yet in a sense revitalized by his indignation, he wasted no time after he entered the legation in finding a computer terminal.

"Records," he said.

RECORDS, the machine replied.

"List all items imported from Earth,

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by the Phuili, during the past twelve months."

LISTING.

He was impatiently drumming his fingers on the console when Gia entered the room. After watching a moment, she said quietly, "Jase, I do not know you too well, but I think I recognize the symptoms. You are mad as hell and ready to pounce on every anomaly in sight."

"OK, so you've been there. What did you do about it?"

She chuckled. "The same as you, I suspect. Fire random shots and hope one of them finds a target." Gia frowned as she peered over Kurber's shoulder at the rapidly scrolling display on the screen. "What are you looking for?"

"What I should have looked for as soon as I got here. The Phuili may have an advanced technology, but that doesn't make their computer systems compatible with ours. I'm guessing they have imported enough hard and software to analyze us humans right down to the last byte. I want to know what, when, and where."

"For readout and translation. Of course!"

"Of course," Kurber echoed, his smile sardonic. Not too successfully he was trying to ignore Gia's proximity; the faint yet powerful subtlety of her fragrance. "This could be the lead to whoever in the legation is delivering what chip, to which Phuili, who in turn is taking it to any one of god knows how many establishments that have imported Earthside equipment." He added dryly. "Our primitive technology is much in demand, it seems."

"Primitive is the word all right." Gia pointed at the screen. "Just look at that stuff. My young nephew was on to better things when he entered grade school."

"You sound surprised."

"Shouldn't I be?"

Kurber grinned. "You'll agree that most Sub Elites, though not as extreme in their views as the Human Eaters, are certainly sympathetic to the anti-human crusade. Right?"

"I don't see what that has to do with—"

"Fraser and his extremists probably number no more than a few hundred. But there are also thousands of borderline xenophobes, outwardly decent people who carry on their lives just like the rest of us."

Gia looked at the man puzzledly. "What are you saying?"

"Only that I suspect it would be quite revealing if we had access to the background files of a few people in the licensing division of the Off-World Export Office."

Gia was startled by the idea. "My god, if that is true—"

His attention still largely occupied by the information rolling across the screen, Kurber went on absently, "Despite their infinite wisdom, however, those same bureaucrats still have not realized how much their restrictions have played into the hands of the Phuili hardliners. Admittedly, the low level hardware they let through is adequate enough for simple readout, even for basic word-to-word translation. But for the hardliners, the advantage is that the imported equipment *is* primitive, in effect being a further illustration of human inferiority."

"Damn and double-damn!" Gia took

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a deep breath and added angrily, "Jase, it's all so bloody stupid!"

"Sure it is. A sort of mutual, self-reinforcing paranoia." Suddenly Kurber's eyes widened and he jabbed the key which halted the flow of data. He touched another key, reversing the display by a few lines. "Now why," he wondered aloud, "do they need that particular item?"

The Great Work was nearly done. All that remained was the transfer of millions of beings, and then the final order from the Apex in his tower above a smog-shrouded sea. The other work would continue of course. What once had only been hypothetical was now a distinct possibility, and teams were already being diverted to the orbital research stations. Either way, the race's holy mission would continue until all things were pure and matter itself was returned to the rigid matrix of the Giver's Law.

Nevertheless the Apex was worried. He had seen the reports of the strange burst of energy from the outer system, the similarity of its spectral components to the explosion which had destroyed Station Eighteen and which had required him to order the termination of the hundreds of thousands whose usefulness had been compromised by the lethal rays.

He did not doubt that life existed among the stars. Time after time, the possibilities had been demonstrated by those who studied the enrichment effect of novae and their shock waves on the interstellar medium. What was in doubt was the nature of that life—was it merely a crawling scum on the bottom of shallow seas, or had it learned to manipulate matter to the extent of building ships that could violate the Holy Void? In which case, what had been the nature of that incredibly concentrated burst of energy? A random natural happening? Faulty detectors? Or had there actually been. . .?

The Apex dismissed the awful thought and sent for the Deputy Eight. "According to the current arrangements, when can I issue the Order?" he asked.

The Eight bowed. "At the Crossing of The Moons, your words will be the instrument by which every adult and lesser will at last know our race's holy destiny."

The Apex nodded, his gray-furred face thoughtful. "It would please me if it could be sooner. Indeed, much sooner."

Though the Eight was surprised, he did not show it. "It will be difficult. Already every available ship is committed. At each rendezvous there is so much to be transferred, so many to be prepared for—"

The Apex gestured impatiently. "That is only because we are organized for a simultaneous activation. Instead, what if we divert the ships to service only fifty of the Units?"

The Eight ws shocked. "But the Day! The Knowing—"

"Is a ceremony, nothing more. That need not be changed. Nevertheless, I happen to know it will serve The Giver's purpose if a few circles of time are sacrificed so that fifty can be activated. . . ." The Apex glanced out at two patches of light in the mud-colored sky, ". . . at the Opposite of The Moons."

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necessary changes, the bemused official finally bowed his way out of the room. The Apex remained in the darkness, his eyes glittering with an ancient hate as his thoughts pulled back the smog to reveal the lights of other suns. "Perhaps you are not there," he murmured softly, "in which case we will be a little premature. But if you are, very soon you will have much to fear. . . ."

It had taken several days of intense negotiating to set it up. Though all the humans were cooperative, the idea of Phuili Subs participating in such a meeting was so startling it required the direct intervention of David and other Elites before Paul, James, and Edward were at last persuaded to attend. Noticeably the three Subs separated themselves as much as possible from the humans, who chatted in subdued tones as they tried to ignore the unusual presences at the far side of the lounge.

At exactly nineteen hours, Kurber, Gia, and David entered and took their places behind a small table. Gia started the proceedings.

"First," she said, "I will not waste time with the obvious. You all know about the written trash from Earth that has been circulating among the Phuili, and you are certainly knowledgeable enough to realize the damage it is causing. Anyway, Earth judged the matter serious enough to send an investigator—" Gia held up both hands in a gesture for silence. As the noise died down, she lowered her hands and smiled. "Yes, it is Jase Kurber. No, he is not Security. He *is* is the Resident Expediter—with the additional mandate to identify and arrest the human who is responsible."

Mason Dewitte heaved his large bulk upright. "Young man, how long have you been an expediter?"

"Not long," Kurber admitted cautiously.

The fat man nodded. "I did not think so. All right, second question. Have you identified the miscreant?"

"I have."

"In that case Mr. Kurber, the floor is yours." Dewitte beamed and sat down.

Even the three Subs showed signs of interest, in that sense being one with the humans. *You'd think I was about to announce who shot J.R.*, Kurber thought, remembering a recognized though obscure expression that had been in vogue during his college days. Looking at his audience of curious faces, human and alien, he prayed he was not about to transform some of that curiosity into hostility.

He cleared his throat. "Memory chips. That seemed the obvious means by which the Human Eaters have been acquiring extracts from *Universe Realities*. It was also apparent they could not be getting that material via the obvious route, through the Phuili legation on Earth. The legation's staff is, after all, exclusively Elite, and will certainly refuse any order aimed against the interspecies relationship the Elites themselves helped to create. That is why my instructions were to find a human who had the motive and opportunity to smuggle the chips through this legation on Phuili."

"You're wasting your time," Barton Hale interrupted from the floor. Kurber had had very little contact with Hale

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since the hair-raising ride in from the shuttle terminal, though from what he had heard of the exo-biologist's love of the put-down, he was certain he was about to experience that particular irritation. Deliberately taking the bait, Kurber asked mildly, "Why am I wasting my time, Mr. Hale?"

"For the obvious and simple reason that our psychological profiles say so," Hale retorted. "My god, even a storefront operator can recognize a xenophobe, and we were examined by the best psychologists in the business. Sorry, Mr. Kurber, but perhaps you should go back to expediting!" To the sound of scattered applause, he smiled smugly.

Kurber waited for silence. Then, "Who said anything about anyone being a xenophobe?"

"You did! You are the one who implied—"

"Mr. Hale, do you like the Phuili?"

"What kind of question is that? Of course I do. I'd hardly be here if I didn't."

"How do you rate the Phuili against human kind?"

"I don't. As far as I am concerned, the Phuili are neither better or worse. They are simply . . ." Hale shrugged his thin shoulders, ". . . different."

"Very good, Mr. Hale. You have just expressed a sane, middle-of-the-road attitude that is undoubtedly shared by most of your colleagues. However, there is one person here who goes a lot further than merely liking the Phuili, who idolizes them to the extent of believing—exactly as the Human Eaters—that humans are indeed a threat to an ancient and perfect society. Now I do not know if the psychologists have a name for that aberration, but I suspect it is one they either overlooked or considered unimportant. Which do you think, Mr. Hale?"

Hale did not reply, though Kurber felt a small glow of satisfaction at the man's obvious discomfiture. Returning his attention to the main audience, Kurber continued. "I admit I was as surprised as anyone when I realized we were dealing with the opposite of a xenophobe. But for me, that was only the second surprise. The first was something I discovered just before I identified the person we have heard described as 'miscreant.' " Kurber signaled, the lights dimmed, and data began scrolling across the big monitor at the front of the lounge.

"Most of you have seen these lists before, itemizing hardware the Phuili have brought in to further their studies of Earth and human society. You will note there are at least a dozen institutions that now have the capability to read imported memory chips, which seems to support the theory that that is how *Realities* is getting to the Human Eaters. There is, however, a problem. Since Pri-A-one was imposed a few weeks ago, everything shipped to this legation has been examined and cleared by a special unit assigned from the Security Service."

Expecting a reaction, Kurber paused. What he did get, instead of indignation, was a stony silence; unexpected though illuminating. It seemed he had underestimated the intelligence of these people, who clearly had anticipated the intervention of the S.S. as soon as they heard of Pri-A-one and the reason for its imposition. Feeling uncomfortably

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like an adolescent trying to lecture a group of adults, the expediter sighed and continued,

"OK, we know two things. First, that someone here is the source of the *Realities* material. Second, that there is apparently no way for illicit chips to get through Earth's security check, let alone to the Eaters."

"So perhaps it ain't chips," someone suggested helpfully.

Despite himself, Kurber chuckled. "How right you are." He turned to the monitor. "What fooled me and everyone else is the use of a technology that predates computers." He pointed. "Optec Reader one-nine-nine-zero VX, delivered to Institution Three in this city. In plain language, I-Three has an optical microscope rigged for amplification and projection. An ideal instrument for reading microdots."

"I'll be damned," Mason Dewitte said.

Kurber looked inquiringly at the fat man. "Something familiar?"

"Speaking as a devotee of twentieth century mystery fiction, darn right it's familiar!" Dewitte raised his voice so everyone could hear. "A microdot is a piece of high resolution optical film, small enough that it can be disguised as the dot at the end of a written sentence." Dewitte wagged a stubby finger. "Jase, I think you are a nice fellow. But if you do not make the rest of it short and snappy, I may be tempted to revise that opinion."

Kurber chuckled. "Short and snappy it is." He held up a slim magazine, typical of a type of specialist publication that had held its own despite mass electronics. "*Social Impact of Extra-Terrestrial Relationships*," he read from the title page. "This little mag and others like it are also imported by the Phuili, though in this case they do not have to order through their people on Earth. Instead they arrange for photocopies of issues brought in by the legation's staff for their own use. So it's no problem for the person who makes those copies to attach a microdot according to a pre-arranged formula—such as the end of the seventh sentence on page four. By the way Ms. Doerker, how do you get the microdots in the first place? Letters from home?"

The only human who did not react sat with prim disdain among the stares and exclamations of her colleagues. Finally, as the excitement died down, Elise Doerker, the legation's receptionist, said calmly. "That is very clever of you, Mr. Kurber."

It was not quite the hysterical denial Kurber expected, and before he could respond there was an explosion of gutterals from the back of the room. No longer silent bystanders, the three Subs were at their full diminutive height as each in turn fired a verbal barrage at the Elite who shared the platform with Gia and Kurber.

David translated, "Zey not wish human female harmed. She fwiend of Phuili who agwee humans bad for Phuili ways. Zey say Human Eaters not act more if female stay and numbers of humans on Phuili not incwease."

The offer was so unexpected that for a moment Kurber wondered if it was an implied threat rather than the concession it seemed to be. But it was a fleeting thought, dismissed in favor of the more probable explanation that the Subs were

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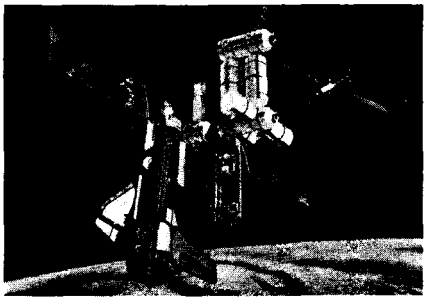

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making the best of a bad situation. Without Doerker's active support they could no longer receive and pass on the grist for the Eaters' propaganda mill, and without effective propaganda the Eaters themselves were no longer a problem.

How about that. I have successfully completed my first assignment as an expediter!

Under normal circumstances Kurber knew he had reason to be at least a little euphoric. But there was still the fact of the Silver People, and from recent dispatches he knew that the human and Phuili negotiators on The Shouter had come no closer to agreeing on a course of action to end the threat. If humans and Phuili had anything in common at all, it was the incredible inertia of their bureaucracies—which permitted representatives of the two races to argue in useless circles while the margin between threat and disaster was becoming perilously narrow. Ethics were fine, an abhorrence against genocide a must for any civilized society, but against true savagery there could be no diplomacy. Humans, with their Caligulas, Hitlers, and Katryn Gervaks should know that. So should the Phuili. It was a Phuili expedition, after all, that had returned with the evidence of this horror in the making.

Perhaps there is another way.

With a rashness belying his natural caution, Kurber got David to ask the Subs, "Do you know if the Human Eaters believe that the human race should be destroyed?"

The reply, though indirect, was vehement. "Iss wong to destwoy wace!" Then, guardedly, "Human Eaters want humans not anywhere except planets of human sun. Human Eaters say galaxy Phuili."

"What if there is a third race, a race dedicated to the destruction of all life other than its own?"

"If attacked, Phuili defend."

"But if the Human Eaters knew of such a threat, would they wait to be attacked? Or would they move to destroy the attackers?"

If the Subs were human, Kurber did not doubt the provocative nature of his questioning would by now have involved him in a shouting match. But he was gambling on the higher flash point of the Phuili temperament, as well as their natural curiosity to know where he was leading. Nevertheless, the delay in the answering of this last question made him nervous. Finally, "Perhaps Human Eaters not wait. But Human Eaters not destwoy wace."

"What if the responsibility for such a pre-emptive act can be shared? What if others, equally threatened, offer cooperation?"

Gia hissed at him. "What others? Jase, you know damn well the government will never sanction such a thing!"

"Who said anything about the government?" Kurber asked innocently. To the Subs, "Well? If they are not required to do the job entirely on their own, would the Human Eaters do what is necessary to save Phuili and the galaxy?"

This time, mercifully, the Subs took only a few seconds to reply. "Wiz help," David translated, "we zink . . . yess."

Kurber took a deep breath. *Bingo!*

It was clandestine but it had prece-

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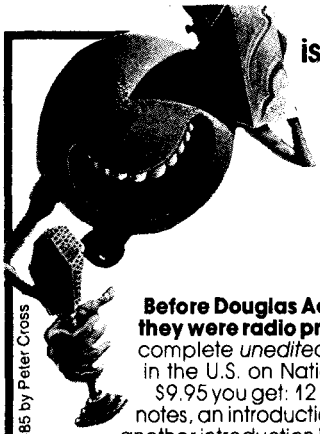

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dents. Historically, Earth nations had often used "client" states or revolutionary movements to wage war while staying clear of the conflict themselves, and though the Phuili did not have that tradition they did seem willing to tread in Machiavelli's well worn footsteps. The separation of one ship from the inventory of each fleet was a minor matter, as was the disappearance of several of Lector Fraser's followers from their usual haunts, and a similar number of Human Eaters from Phuili. The removal of a pair of sun seeds from storage was not even explained, though if any Phuili chose to query the records he might wonder about a proposed experiment to induce instabilities in a minor star beyond the galactic hub.

After a short but intensive period of ship familiarization and training, the two dissimilar space craft lifted off from separate island continents on the planet Groombra Four and flared into the super-light condition known as phase-shift. Forty years later, observers on Groombra Four (since renamed Harmony) saw a faint star become a little brighter and then slowly fade back to its original magnitude. The time gap was, of course, due to the forty light years of distance, and two of the observers had been present those four decades earlier, when one of the ships returned to its base on the Second Continent. The two observers remembered

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that the men and women who emerged from the ship had been strangely subdued. . . .

"Did everything go as planned?" Kurber asked anxiously.

The Captain's smile was tired. "Exactly. The dogfaces went in first with their egg, then we with ours." His face brightened. "My god, you should have seen that sun flare!"

"The Silver People—"

"The home planet is a cinder. There are still a lot of outposts of course, but they won't last long. No way they can recreate the necessary technology."

"So why the long faces?" Gia asked. "Have you discovered it's not so easy to obliterate a race after all, even one as unpleasant as the Silver People?"

The Captain held out a hand. "Look. Steady as a rock. No guilt here, lady, or with any of the crew."

"So what is the problem?"

"You won't like it."

"Try us."

The Captain turned his eyes skyward, toward an insignificant speck amid the evening's dusting of stars. "I know we destroyed a hornets nest," he said quietly. "But I am not so convinced that we got all of the hornets."

On the First Continent, the Phuili commander said to Davakinapwottapellazanzis, "Our instruments detected the event as we were preparing to leave. It had all the characteristics of a ship going into phase shift."

"It must have been the humans."

The Captain shook his head. "We had just exchanged location data with the flat-faces. Their ship was on the other side of the system."

They had not had time to develop phase shift to an interstellar capability. But what they did know was enough to slingshot the fifty units to a distance of half a light year. They almost didn't make it: the last of the fifty flared out of normal space even as the home world burned and the outposts prepared to die.

The Apex had been right. Although the garden was destroyed, the wisdom of his planning had ensured that enough of its seeds were safely dispersed into the Holy Void.

Now they were spread across the surface of an expanding sphere nearly a light-year across. Inert and totally subject to the laws that move stars and galaxies, each was enormous: a complex of metal and rock, of concrete made from space dust and powdered moonlets, and of hundreds of needle ships anchored to the surface like bristles on a brush. Deep under the surface, thousands of beings lay like death in great stasis chambers, waiting only for the signal that would prick their bubbles of timelessness and allow them to continue the Great Cleansing.

It would be more than a century before even one of the silently drifting arks came close enough to the triggering warmth of another sun. But space is so huge, a few tens of years was not much time in which to find and destroy those dormant seeds—before they sprouted and began to spread anti-life into the universe.

For the xenophobes of Groombra Four, what was done had only been the beginning. . . . ■

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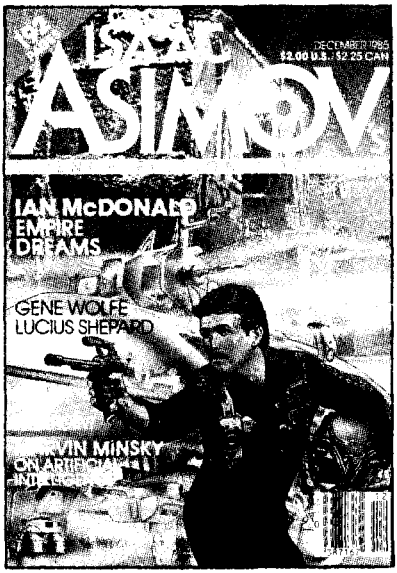

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Dr. John Gribbin

BEFORE THE BIG BANG

The great triumph of cosmology in the 1960s was the discovery that the "standard Big Bang" model could explain how the Universe as we know it evolved out of a hot fireball of matter and radiation. But it couldn't say where the hot fireball came from in the first place. Simply by winding back, in our imagination, the present day observed expansion of the Universe, theorists were able to reckon that it was created out of a state of infinite density (a mathematical singularity) some 15 billion years ago. And although the moment of creation itself was unapproachable, it seemed pretty much a triumph of physics to be able to account for everything that had happened from the end of the first hundredth of a second *after* the moment of creation up to the present day. Steven Weinberg's famous "first three minutes," indeed, only *started* at time $t = 0.01$ sec.

But, of course, that remaining hundredth of a second niggled. Cosmologists wanted to know how the Universe came into being in the first place, and they puzzled over the remarkable uniformity of the Universe we live in. Were there special boundary conditions that set the expansion up to produce such a beautifully smooth Universe? Or is the smoothness an inevitable consequence that comes out regardless of the starting conditions? In the May 1985 issue of *Analog*, G. F. R. Ellis and Tony Rothman introduced us to the "Garden of Cosmological Delights," addressing some of these remaining puzzles and their sometimes exotic interpretations.

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We have learned in the 1980s, thanks to a marriage between particle physics and cosmology, that everything can now be explained back to a tiny split second after the moment of creation, 10^{-43} sec after $t = 0$. In the interval from 10^{-43} sec to 10^{-35} sec, a period of exponential growth called inflation blasted the Universe up from the size of a proton to the size of a basketball, smoothing out any irregularities in the process and setting the scene for the regular expansion of the standard Big Bang. The first hundredth of a second, it turns out, is more important than all of the rest of the 15 billion years put together. And most important of all is the moment of creation itself, that first 10^{-43} seconds in which our understanding of time, space, and gravity themselves all break down as quantum effects dominate the birth of the Universe. Such is the confidence—or chutzpah—of a few cosmologists today, however, that they are now addressing this last great question: how did time begin, and the Universe come into being, as a state of almost infinite density far smaller than a proton, *before* the Big Bang took over and made it expand?

One of the most dramatic implications of the idea of inflation in its 1985 form is that the whole Universe may have appeared out of literally nothing at all, created by quantum uncertainty. The idea goes back to Heisenberg's uncertainty principle, a fundamental law of quantum physics which says that it is impossible for two members of a pair of so-called conjugate variables *both* to be precisely defined. If a particle has a precise location in space, then inevitably there is some uncertainty in its momentum—where it is going. If the momentum is well defined, then the position *cannot* be. This has nothing to do with our ability to *measure* position, or momentum; it is a feature of the dual nature of things as both wave and particle. Position and momentum are one pair of conjugate variables; another is energy/time. The laws of physics require that the amount of energy a system contains is uncertain, and that the shorter the time interval being considered the greater is the uncertainty.

It is this trick that enables alpha particles to escape from radioactive nuclei. The particles don't quite have enough energy to escape, according to everyday physics, but still they are observed popping out from time to time. George Gamow explained why, back in the 1930s. An alpha particle can borrow enough energy from the uncertainty relationship to get out of the nucleus, provided it gives it back before the Universe has time to notice. By then, the particle is free from the nucleus and off and running, so it no longer needs the "extra" energy, anyway. The more energy that has to be borrowed, the sooner it must be rapaid; but small amounts of energy can be borrowed in this way for respectably long time intervals. In a similar way, physycists now envisage the vacuum—"empty space"—as a froth of particles that appear spontaneously, using borrowed energy which is turned into matter in line with $E = mc^2$, and promptly disappear again before the Universe notices the energy conservation law has been violated. And

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these so-called virtual particles are not just a mathematical trick: their effects on things like electric forces can be calculated, and have to be included to get a correct description of the forces between, for example, real charged particles. But it took a great leap of the imagination to suggest that the *whole Universe* might have appeared like this, as a fluctuation of the vacuum.

The idea surfaced in *Nature* in December 1973, in the form of a scientific paper from Edward Tryon, of Hunter College, City University of New York, in which he called it "the simplest and most appealing" Big Bang model imaginable. (*Nature*, volume 246 page 396.) The jumping off point for his introduction of this model into cosmological debate was a calculation which showed that any closed Universe must have zero net energy. Crudely speaking, we can understand this in terms of the negative gravitational energy that the Universe possesses, which is so large (in a negative sense) that it cancels out all of the mass energy, mc^2, of the matter in the Universe. But this is only a crude representation of a more subtle and sophisticated mathematical argument which *proves* that a closed Universe has zero energy over all. It is the "free lunch" taken to its logical extreme; if the Universe contains zero energy, no wonder it is free. Not something for nothing, after all, but *nothing* for nothing. Tryon pointed out that the uncertainty relation allows anything with zero energy to exist for as long as you like. There would be no problem about "borrowing" energy from the vacuum to create the Universe, because you don't need any overall energy in the first place, and you don't have to hurry to pay it back, because there is nothing missing from the balance account!

Surprisingly, the basic idea of something for nothing goes back at least thirty years before Tryon's version appeared. In his autobiography *My World Line*, George Gamow tells about his role during World War Two as a consultant with the Bureau of Ordinance in the US Navy Department in Washington, DC. Gamow was not allowed to work on the atomic bomb, because he was a Russian by birth and delighted in telling all his friends that he had been a colonel in the Red Army at the age of twenty. Even allowing for Gamow's predisposition to tall tales and practical jokes, this wasn't to be taken lightly by those responsible for security on the Manhattan Project. So he spent the war years in Washington.

One of Gamow's jobs, however, was to deliver a briefcase full of papers to Albert Einstein, in Princeton, once a fortnight. Although officially secret, these papers had nothing to do with nuclear weapons. They described all kinds of ideas for new weaponry, which Einstein was expected to comment on for the Navy. Einstein would almost invariably comment favorably, as Gamow tells it, no matter how weird and wonderful the new ideas for explosive devices. One day, while walking with Einstein from his home to the Institute for Advanced Study, Gamow mentioned that Pascual Jordan had come up with a new idea. Jordan was one of the

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pioneers of quantum physics, who made his name through work with Werner Heisenberg and Max Born which established the basis for the first version of quantum mechanics, called matrix mechanics, in 1925. His new idea didn't seem, in the 1940s, to be in that league. It was, indeed, just one of those crazy ideas physicsts like to mull over during coffee time, or while walking through Princeton. What Gamow mentioned to Einstein on their walk was Jordan's idea that a star might be created out of nothing, since at the point zero its negative gravitational energy is numerically equal to its positive rest mass energy.

"Einstein stopped in his tracks," Gamow tells us, "and, since we were crossing a street, several cars had to stop to avoid running us down."

The idea that stopped Einstein in his tracks is the same idea, now applied to the whole Universe, not just a star, that researchers such as Ed Tryon are taking very seriously indeed in the 1980s.

Tryon's naively simplistic interpretation of the uncertainty rules made no great splash in the 1970s. It was just one of those passing comments that physicists often toss around during coffee time, and it clearly did not provide a precise description of our Universe. Taking the analogy with the creation of pairs of virtual particles literally, it would require, for example, that our Universe contained precisely equal amounts of matter and antimatter, which doesn't seem to be the case. And if a quantum fluctuation containing all of the mass of our Universe *were* created in a superdense state, why on earth didn't it promptly collapse into a singularity under the influence of its own self-gravity?

The difficulties looked insurmountable. But the advent of inflation changed all that. Inflation provides the mechanism to blow the seed of the Universe up to a respectable size before gravity can make it collapse back into a singularity. Fifteen billion years of gravitational slowing down are still far from cancelling out the expansion triggered in the first 10^{-35} seconds. And it tells us that an energetic original Universe created with equal amounts of matter and anti-matter will still evolve into a Universe with a slight residue of matter in it, in the fullness of time (the "fullness of time" being that same 10^{-35} sec). Hardly surprisingly, Ed Tryon himself revived his idea in the context of inflation in the 1980s, and in 1982 it was also taken up by Alexander Vilenkin, of Tufts University.

Vilenkin's unusual career development is worth a brief mention. He was born in Kharkov in the USSR in 1949, and obtained his BSc in 1971 from Kharkov State University. But, he told me, he was unable to obtain a research post because he is Jewish, and he spent five years first in army service and then earning a living at various odd jobs (his favorite, he says, being night watchman in a zoo) before emigrating to the US in 1976. During those five years, however, he had been studying physics in his spare time, to such good effect that in 1977, the year after he arrived in the States, his work earned him a Ph.D. from the State University of New York, Buffalo.

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Vilenkin, indeed, takes things a step further than Tryon did in 1973. Tryon talked about a "vacuum fluctuation," implying that some form of spacetime metric existed before the Universe came into being; but Vilenkin is trying to develop a model in which space, time, and matter are all created out of literally nothing at all, as a quantum fluctuation of nothing. "The concept of the universe being created from nothing is a crazy one," Vilenkin says in one of his papers (*Physics Letters*, volume 117B, page 26, 4 November 1982); but he goes on to show how it is mathematically respectable. And his comment echoes, perhaps consciously, Niels Bohr's much-quoted remark to a colleague in the 1920s—"your theory is crazy, but it isn't crazy enough to be true." In this and other recent papers, Vilenkin puts a lot of respectable mathematical icing onto the basic cake baked up by Tryon, in more speculative form, in the early 1970s. Maybe this theory *is* crazy enough to be true!

The idea is still highly speculative, but it is now much more attractive. It also predicts the ultimate fate of the Universe. In the far distant future, the Universe will collapse back into a tiny singularity. Spacetime itself, and everything it contains, will disappear into a single point and vanish. In that case, there may indeed have been a moment of creation, marking the boundary of the Universe at the beginning of time. And there is an equivalent boundary, or edge, to the Universe at the end of time. But physicists still hate the idea of a singularity, or discontinuity, which marks the boundaries of spacetime, and many would be happier with a theory that removed the need for such abruptness. There is such an alternative view, one that is, if anything, even more deeply rooted in the basics of quantum physics. Stephen Hawking of the University of Cambridge has developed an approach based on the concept of defining a quantum mechanical equation—a wave function—that describes the entire Universe, and dealing with this as one could any other wave function in quantum physics. And he says that there may be no boundary to the Universe, even at the moment of creation.

The model that Hawking proposes, and that is still being developed, has not yet won the kind of acceptance that his earlier work on black holes has achieved. But it strikes to the heart of the remaining puzzles about the origin of space, time, and matter, and it is quite clearly the most complete, coherent account of the moment of creation that is on offer today.

General Relativity tells us that there must be a singularity at the beginning of time—the moment of creation. But General Relativity, like all of our theories of physics, breaks down for times earlier than the so-called Planck time, 10^{-43} sec. This is the earliest moment, or the shortest interval, for which the concepts of space and time have any meaning—it is, if you like, the quantum of time. And General Relativity is a theory of space and time; without space and time as we know them, there is no theory. At the Planck time, the entire Universe we can see today was con-

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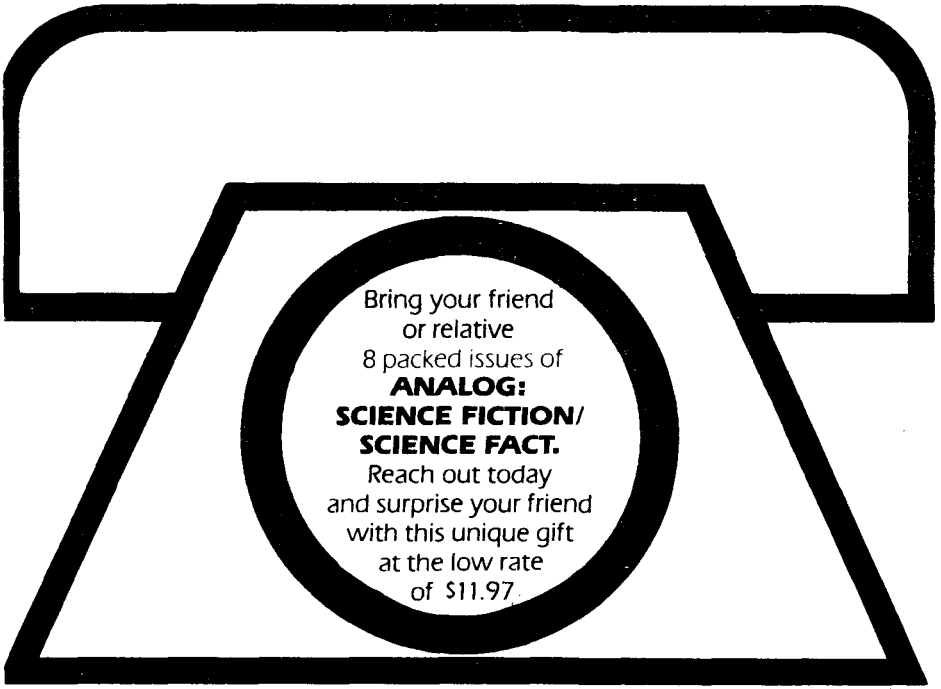

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tained in a volume just 10^{-33} cm, the Planck length, across. The problem Hawking has set himself is to develop a mathematical model, a set of equations, to describe our Universe in a self-contained way—avoiding the embarrassment of a singularity at $t = 0$. He attempts to combine General Relativity and quantum theory, at least partially, in a good working model of the Universe.

What version of quantum physics, however, is appropriate when we are describing the whole Universe? Quantum theory tells us nothing about how a particle, or a system, gets from state A to state B. The conventional interpretation of quantum physics is the Copenhagen Interpretation. This says that when we are not looking at a system it exists in some sort of superposition of all the possible states it could be in, and that the act of measuring the system—or looking at it—causes a "collapse of the wave function" into just one of these possible states, a state selected solely on the basis of probability. When we stop measuring the system, or looking at it, it once again becomes a superposition of states, only to collapse again, perhaps in a different way, the next time it is measured. This interpretation of the quantum math works very well as a practical tool for calculating how atoms and subatomic particles (and, indeed, molecules) will behave. But it is hardly common sense, and there is a real difficulty in trying to apply the Copenhagen Interpretation to the entire Universe.

There is an alternative interpretation, which gives exactly the same "answers" as the Copenhagen Interpretation in every case, but which is based on a concept so bizarre that most physicists reject it out of hand. But it is a favored idea in science fiction—the idea of alternative realities or "parallel worlds." (Although, as I pointed out in a story in the August '84 *Analog*, it ought to be "Perpendicular Worlds.") This is the Many Worlds Interpretation, and it says that every time a particle or system is faced with a choice of options at the quantum level, every possible option is taken up, with the whole Universe splitting into the appropriate number of alternative realities to accommodate all the choices.

To get a handle on the application of this idea in practice, think of an object like an electron moving from Point A to Point B. The Copenhagen Interpretation says that we have no idea how the electron got from A to B. All we know is that at a certain time we measure the position of the electron and get the answer A; later we measure its position and find it at B. In between, the concept of the electron as a particle with a definite position has no meaning. This is in stark contrast to the traditional ideas of Newtonian mechanics, which say that there is a unique trajectory which the particle follows all the way from A to B. Using the Many Worlds idea, however, Richard Feynman developed an alternative understanding of the way the electron gets from A to B, which contrasts *both* with Newton *and* with the Copenhagen Interpretation. He said that we should regard the electron

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as having followed *every possible* path from A to B allowed by the laws of physics. Because the electron is also a wave as well as a particle, the waves corresponding to these different paths will interfere with each other, adding together here and cancelling out there. When the calculations are carried through, it turns out that the result of all the interference is to leave a trajectory describing the route of the electron from A to B—the probability of any particular trajectory can be calculated, and the most probable path is always the trajectory corresponding to the movement of a "classical" particle from A to B in accordance with Newton's laws.

In the Copenhagen Interpretation, there is *no* electron path from A to B; in classical theory, there is a single unique path; in Many Worlds theory, the electron follows *every possible* path, all at the same time. For obvious reasons, the Feynman version of Many Worlds theory is called the "sum over histories," or "path integral" approach. And Hawking's breakthrough has come from applying these concepts (although not the detailed calculations!) not to an individual electron, but to the whole Universe!

We can imagine the Universe as being described by quantum mechanical wave functions, of course, even if we can never hope to write down the equations that would describe the "wave function" of the entire Universe. In this case the "sum over histories" is literally that, an adding together of all the possible ways in which the Universe could evolve. Of course, we cannot even calculate one "history" of the Universe in detail. But we can choose a set of starting conditions for the Universe — boundary conditions—and we (or rather Hawking and his colleagues) can calculate the evolution of a simple version of the Universe, that contains just a couple of mathematical fields, one representing gravity, one representing matter. The hope is that this simple model, which Hawking calls minisuperspace, will bear enough resemblance to the real Universe for him to deduce the broad features of the evolution of the Universe. And that hope seems to be fulfilled.

Hawking chooses to describe the *four* dimensions of spacetime as a closed surface like the surface of a sphere, or the surface of the Earth. The idea of the *three* dimensions of space forming such a closed surface, which expands as time passes, is probably familiar to *Analog* readers. But now we have to think of spacetime, not just space, in this way. Extending the analogy, *space* would be represented not by a surface but by a line, which we can choose to be a line of latitude circling around the spherical surface that represents the fabric of spacetime. Time could then be represented by the "distance" from the pole along a line of longitude, and if we start out from, say, the North Pole and move toward the equator, the circles that represent space (lines of latitude) get bigger as "time" passes and we approach the equator. Such a model of the Universe is completely self-contained. There are no edges, and there are no singularities

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in either space or time. It is the simplest possible geometry that could describe the Universe, and it is a geometry that can only exist because quantum effects change the rules of relativity theory, which on their own insist that there *must* be a singularity at the beginning of time. Quantum effects around the time $t = 10^{-43}$ "smear out" the effects of General Relativity, and remove this restriction.

Hawking stresses that his proposed state of the Universe is just that—a *proposal*. He suggests that the boundary condition of the Universe is that "it has no boundary"—no edges, no singularities, no beginning or end of either time or space. The astonishing thing is that this simplest of all possible boundary conditions leads him to an entirely plausible description of the Universe, indistinguishable from what we see about us.

Hawking's tests of this model use the sum over histories approach to quantum physics. In principle, the idea is to add up the effects of all the possible histories which satisfy the boundary condition—all the possible universes that are finite in size and have no boundaries. In practice, he has to make many simplifying assumptions, boiling his model universes down to the basic two fields that I mentioned. But when he does this and carries through the path integrals, he finds that most of the histories cancel out, because of interference from neighboring paths, just as in the equivalent calculations of the orbit of an electron in an atom. Only a few of the possible histories are reinforced and therefore have a high probability. They form a family of high probability histories, which share several important properties. One is that they expand uniformly in all three space directions; another is that they each expand out to a definite size, then contract back into a state of very high density like the state of our Universe at the Planck time, before expanding once again. And each cycle of expansion and collapse is exactly the same as the one before. The Universe doesn't expand to a bigger or smaller amount in consecutive cycles, but always by exactly the same amount. Even better, the interaction of the two fields in Hawking's models produces an initial phase of very rapid expansion —inflation—before the matter begins to dominate the Universe and causes it to switch over into the kind of sedate expansion we see in the Universe today.

Any one of these allowed universal histories would be a good description of our Universe, as a closed system with no boundaries and no singularities, eternally fated to carry out a cycle of expansion, collapse, and expansion. It is easy to see why Hawking is excited by the possibilities thrown up by his model. But the model also throws up some strange and wonderful new ideas. The first is the implication that there are other universes in the family of allowed histories, going through their cycles of expansion and collapse in some sense alongside us (next door in superspace). SF writers are already latching eagerly on to the idea, and Stan Schmidt tells me he has some variations on the theme lined up for you (in fact, some of them you've seen already). But according to

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Hawking there is no way we could ever become aware of the other universes, let alone communicate with them. Because of the way quantum physics works, whenever we make measurements or carry out experiments we will get results in line with one quantum state—the wave function that describes "our" Universe and everything in it, including ourselves. Intelligent beings that occupy a quantum state which corresponds to a second highly probable wave function of the Universe will make their own observations and always get answers appropriate to that wave function. Apart from cancelling out some wave functions and reinforcing others, the quantum states do not interact, and the results of experiments are always in line with one or the other "classical" solution to the equations. Even so, restricted to knowledge of just one out of the many worlds that Hawking's model says exist alongside each other in superspace, we can gain new insights into the fate of our Universe, and into the nature of time.

Look again at Hawking's model of the four-dimensional Universe as a smooth sphere. The rings of constant latitude that expand outward from the North Pole represent the expanding Universe of space, and the North Pole itself represents the Big Bang—the moment of creation. But there is no singularity at the pole. It is just a place where we measure time from. In the same way, the fact that the real North Pole of the Earth is a place we can measure latitude from (in fact, we define the *equator* as latitude 0°, but we could just as easily measure from the Pole) doesn't mean that there is a singularity at the pole. There is nothing farther north than the pole, but that doesn't mean that space has an edge there. And there is nothing earlier than $t = 0$, but that doesn't mean that time began then. The moment of creation, $t = 0$, is now just a convenient label against which to measure time.

Hawking first presented these ideas at a conference on cosmology that was held in the Vatican in 1981. The physicists and mathematicians who attended that conference were granted an audience by the Pope, who told them that it was quite in order for them to study the evolution of the Universe *after* the moment of creation, but that the puzzle of the beginning of time itself was a matter for religion, not science, and represented the work of God. Perhaps the Pope's advisers had been too tactful to point out to him that Hawking's model of the Universe removed the singularity at the beginning of time, and therefore removed the role assigned to God by the Pope. Or perhaps the full import of what Hawking had told the conference had not sunk in.

But what happens at the equator? If we continue to draw a series of lines of latitude around the globe farther and farther south, they get bigger—the Universe expands—until the equator, but after that they become smaller and smaller, eventually shrinking out of existence at the South Pole. This is equivalent to the contracting phase of Hawking's universe, and it has important implications for our understanding

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of the nature of time. Time exists because the Universe is evolving from a state of order (low entropy) to a state of disorder (high entropy). The Universe expands from the ordered state of the Big Bang into the disordered state of the far future. It might seem natural to guess that during the collapse phase of its life, the Universe will be evolving from a state of disorder into a state of order—the flow of entropy is reversed, winding up the cosmic "clock" ready for the next phase of expansion.

The three-dimensional Universe is ordered when it is small, and disordered when it is large. Why should it be ordered when it is small—why should entropy be forced to run backwards as the Universe contracts? Perhaps simply because there is no "room" for disorder in the smaller Universe. A line of latitude around the equator, or close to it, can be quite wiggly and still be a reasonable approximation to a line of latitude. But a line of latitude drawn tightly around the North or South pole cannot wiggle without crossing over the pole itself. In the Planck limit, at $t = 10^{-43}$ sec, the Universe is so small that it must be very uniform indeed. So, if this picture is correct, that is why the arrow of time defined by entropy is the same as the arrow of time for which the Universe gets bigger as time passes. But are the two arrows of time then out of step in the contracting Universe? Not necessarily, according to Hawking. In a series if lectures he gave in 1983 at the Les Houches summer school in France, he said "whether or not the arrow agrees with the direction of time defined by the expansion remains to be shown." The implication is that conceivably *both* arrows could reverse together but would still agree with each other. (Most of my discussion of Hawking's universe is based on the published version of the Les Houches lectures, plus copies of several of his scientific papers which Hawking gave me; none of it is in the text books yet.)

And that has some curious implications. Instead of stars radiating heat out into space, they would be soaking up electromagnetic radiation—electromagnetic radiation coming in toward them from all directions in space, conveniently focused onto each individual star. Inside the stars, the incoming radiation would drive nuclear processes that converted helium into hydrogen, while on a planet like our own ice cubes would radiate heat and grow larger, while living things "grew" from old age to youth. It sounds bizarre, but it is no more than the world we see about us described in time reversed language. The reality is that there is a change from one state to another; the labels which define "forwards" and "backwards" with respect to that change are arbitrary. And if entropy is running backwards then so will the thought processes that make intelligent creatures intelligent. Any intelligent creatures living in what we call the contracting phase of the Universe would think "backwards" compared with our way of thinking, and would still "see" heat flowing from hotter bodies to cooler ones, and would deduce that the Universe was expanding, but that it would ultimately switch

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over into a state of collapse—the phase of the cycle that *we* think of as the expansion phase! As far as intelligence is concerned, not only does Hawking's model have no boundaries, but each cycle of each quantum history of the Universe has no end, just two distinct beginnings.

There are problems, of course, about what happens at the "equator" when the Universe switches over from expansion to collapse. But I told you that the new description of the Universe was still incomplete—and, after all, we have to leave some room for the SF writers to maneuver in with their speculations! Hawking's description of the Universe is still a long way from being, well, *universally* accepted. But my hunch, for what it is worth, is that this, more than even the famous work on exploding black holes, is what he will be remembered for by the next generation of scientists. ■

The subject matter of this article will be incorporated in John Gribbin's next book, In Search of the Big Bang, *which will be published by Bantam in 1986.*

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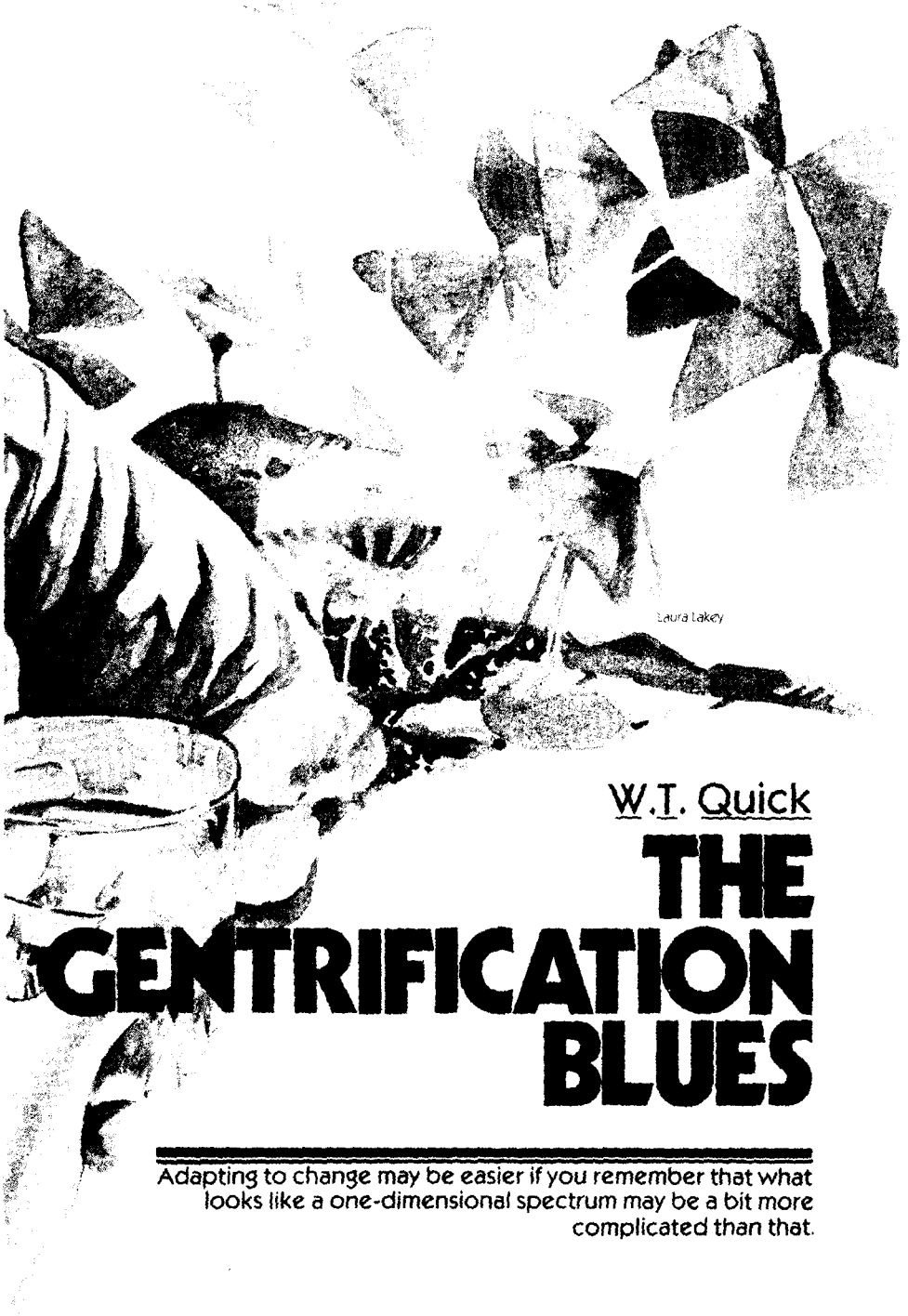

W.T. Quick

THE GENTRIFICATION BLUES

Adapting to change may be easier if you remember that what looks like a one-dimensional spectrum may be a bit more complicated than that.

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It was an unseasonably warm February night in Middlegrove, Indiana, so that what should have been several inches of snow was only a chill rain driving steadily at the window through which Frank Henderson watched the big Mayflower moving van arrive at the Northrup place across the street. He turned to his wife Edna and said, "Godawful night for it, but somebody's moving into the Northrup house. Van just pulled up."

She put down the copy of *People* she had been reading, smoothed the lap of her flannel robe, and stood up. Straggly wisps of brown hair peeped from beneath a flowered plastic cap perched atop her small, apple-shaped face. She was proud that soap had never touched her rosy cheeks, and religiously applied a thick layer of cold cream every evening. All her friends told her she looked much younger than her forty-two years. As she came toward the window, the big maple rocker by the fireplace went crick-crick as it slowed.

"It's a strange time to be moving in," she said. She looked at the ship's clock on the mantel, a wedding gift from her mother, and said, "Almost ten o'clock. I wonder."

"Maybe they're business people. Some kind of tight schedule, and the truck could only—"

"Let me look," she said. She moved past him and brushed the thick gold drapes out of her way. She stuck her nose right up to the glass. Her breath made silver-gray spots grow and fade on the cold surface. "I can hardly see anything," she complained.

"You don't have your contacts in," Frank said. "How can you expect to see?"

She continued to peer into the gloom. "No, it's the rain, Frank. I'm not blind yet." Her nasal midwestern voice was tart.

"Well, they won't get much done in this weather," he said. "I guess you can watch to your heart's content tomorrow." He looked over her shoulder. If anything, the downpour was heavier. The way the light in the room was, he saw more of his own thin, balding reflection than any of the shadowy movements across the street. The appearance of his gaunt, hollow face saddened him. He knew he looked older than his four decades, and the gold-rimmed glasses he insisted on wearing didn't help any. But contacts hurt his eyes, and the new surgical techniques were too expensive. Edna was after him to have the operation anyway, but on his meager bartender's salary, how would he pay for it? He was thankful to be working at all. The television news channel reported forty percent unemployment, and the figure was expected to rise.

He turned away from his accusing reflection. "Who would buy that old house anyway?" he said. "Nobody's lived there for maybe five years. What kind of condition could it be in?"

Edna kept trying to see into the night. "It was a good place once. Solid. There's three bedrooms and a family room. Even a fireplace. Besides ours, it used to be the nicest place on the block. All it would take is a little hard work, it would be good as new."

He nodded thoughtfully. "Maybe," he said. He touched her gently on the shoulder. "Come on, we ought to go

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to bed. I have to get up early tomorrow. There's a banquet at the club. You know we can always use the extra money."

Her eyes met his in the glass. "That sure is the truth," she said.

He wondered what had happened to the shy, lovable girl he'd married just after he'd graduated from high school. The girl who thought he could do no wrong. But he knew the answer. The years had eroded her away, the steady chipping and crumbling of their dreams. "All I am is a bartender," he mumbled, hating the self-pity, but succumbing for a moment anyway.

"What?"

He sighed. "Come on, Edna," he said. "Off to bed."

By morning the storm had rumbled on toward the east, and the world outside was fresh and bright and clean. Their carefully tended lawn, still winter brown, at least showed no new bare spots. The temperature had dropped, and a coating of frost remained in the shadow of the house. The paper was a bit damp when he gathered it in from the front porch.

The big truck was still parked in the driveway across the street. There was no sign of the new neighbors, and the drapes in their picture window were drawn tightly shut.

As he finished his coffee, the last of the morning news made a cheerful rattle on the radio. "I wonder if we'll like them," he said.

"Who?" Edna had removed the plastic cap, but her hair was still in curlers.

"The new people moving in," he said.

She shrugged. "People are people," she said. "No reason why we shouldn't. I'll go over this morning and introduce myself. Invite them for coffee, maybe. They probably don't have their kitchen set up yet."

"That would be nice," he said. "Welcome them to the neighborhood." A thought struck him. "Maybe they play bridge."

"I'll find out," she said.

"Is there any more coffee?" he asked.

She glanced at the automatic coffeemaker. "About half a cup. You want me to make another pot?"

"No. That's fine. I'll have a cup when I get to work." He leaned across the table. "Give me a kiss, honey."

She presented her cheek, which he dutifully pecked. "I'll be back around nine."

She nodded absently. "Have a good day, dear," she said.

"Okay. You too."

He opened the garage door and let the car warm up before he pulled out into the driveway. He pressed the button on the floorboard for the automatic door closer, and watched the door jerk slowly down. Halfway shut it paused for a long moment before finally shuddering the rest of the way. How old was that thing, anyway? His dad had bought it back in 1976. Seventeen years. A miracle it still worked at all. A lot of things were wrong with the house, but again, where was the money? If he hadn't inherited the place free and clear after his mom died, he wouldn't have a home of his own at all. So there was some good in it.

Babying the 1983 Chevy, he pulled slowly out into the street. Lucky it hadn't needed repairs lately. He had to

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have the car. There was no way to get to the country club without it. Sometimes it all exasperated him. He had to live in the house, because it was all he could afford. He had to work at the club, because it was the only job available to him and besides, he had twenty years seniority. Because Middlegrove was a small town, the public transportation wasn't very good. So he had to drive a car. And each year, everything seemed to cost more. The trap grew tighter, and he couldn't see an end. At least, not one he cared to think about.

Something caught hs eye and he stopped the car. The front door of the Northrup place stood open. He looked at it for a moment, then reached for the keys and shut off the engine. Why not? He would never admit it to Edna, but he was as curious as she probably was about the new people.

As he stepped up onto the porch, he noticed that the concrete of the top step had begun to crack badly. Have to fix that, he thought, and remembered half a bag of cement he had in his garage. I'll see if they can use it, he told himself.

The wooden front door was open, but the screen door was shut. He could hear faint scuffing sounds inside, and a deep, rumbling voice. He couldn't make out any words. Then he smelled the odor. He wrinkled his nose. Violets? Yes, that was it. Very strong. But why would they have flowers before they'd even unpacked the van?

He waited a few seconds, then straightened up and knocked on the screen door. No answer. Another minute. He pressed the doorbell and heard chimes ring somewhere in the back of the house.

"Hello?" he called. "Anybody home?"

Footsteps approached the door. Heavy steps. Suddenly his new neighbor appeared, his vast green bulk filling the doorway.

Frank's mouth dropped open.

"Hi, there," the alien boomed. "Can I help you with something?"

When Frank got home that night, Edna had a pot roast waiting. It had been a busy shift. Frank was tired and his shoulder muscles ached. I'm getting too old for this, he thought. Then, forty? Is that too old? What's happening to me?

Edna brought a bowl of mashed potatoes and a plate of Wonder bread to the table. She was tight-lipped. Frown lines showed at the corners of her mouth, through the thick layer of makeup.

"You could have told me," she said. "I saw you stop."

Frank cut a slice from the pot roast. "Told you what?"

"What they were. Those . . . things across the street."

He chewed slowly. He had been dreading this moment all day. "I had to get to work, Edna. I figured you'd find out when you went over."

"I was so embarrassed." She emphasized the last word heavily. "That huge ugly—" She shook her head. "There are three of them. Those *things*. Three, Frank." Her voice quivered slightly.

She believes that anybody who comes from farther away than Indianapolis is a barbarian, Frank thought. "Did something happen?"

"Oh, no," she replied. "Nothing

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happened. They were very polite. It's some kind of marriage. Only it takes three of them. Can you imagine?''

During his off time that afternoon, Frank had used the computer in the club's reading room. ''They call themselves T'chai. Well, that's as near as it sounds in our language. Their home planet is pretty far away.''

It had been 1988, Frank remembered, when the UFO mysteries had finally been solved. No more tantalizing sightings or strange stories in the *Enquirer*. ''I Was Kidnapped by Extraterrestrial Werewolves.'' There came hundreds of ships, all at once, and thousands of aliens. One big vessel landed right on the White House lawn and conveyed greetings from the Hespeth Confederacy to the President. Trade and commerce, the aliens had said. Within three months, Earth was granted probationary membership.

Everybody had watched television then. And everybody, even if they hadn't admitted it, had been a little frightened. But nothing had happened. Now you only saw aliens on the educational channels, or when some big new economic agreement was signed.

''Frank! How can they come here? To Middlegrove. Isn't there a law about . . . their kind?''

He shook his head. ''None at all. As long as they follow our laws, and have money to pay, they can live wherever they want. But you're right. I never expected to see them here. I would have thought the big cities—'' His voice trailed off. *I* don't want to live here, he thought. Why would they? ''And we could live on one of their planets, if we wanted,'' he said.

Edna's face grew tight as a drum at the thought. ''Who would want to?'' she said. ''Nobody decent, that's for sure.''

''Yes,'' Frank said. ''In a way, I'm sorry you feel like that. A lot of people are going to agree with you.''

''Of course they are,'' she said. ''What's wrong with that?''

''Well, for one thing, the value of our house will drop maybe thirty thousand dollars. Maybe more. Who would live in our neighborhood now? You watch. Within a month there will be two or three houses for sale. Just on this block. And they'll be taking whatever they can get.''

Her forehead wrinkled. ''Frank? Could we do that? Sell out?''

''And do what?'' he asked bitterly. ''Collect unemployment? Live in some ratty apartment? Would you like that, Edna?''

Her cheeks appeared doughy in the harsh overhead light. Suddenly, she looked every minute of her age. Almost with satisfaction Frank thought, Now she sees the trap, too.

He cut another slice of pot roast. ''We'll wait,'' he said. ''We'll just wait. And see.''

She nodded slowly. ''I've got strawberry ice milk for dessert,'' she said uncertainly. ''Do you want chocolate syrup on it?''

But they decided they weren't really that hungry, after all.

One month later, two things happened. The Johnsons down the block put their house up for sale—Betty Johnson told Edna, ''We have the children to think of, after all''; and it started to snow. Frank had weekends off, and

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about five o'clock Saturday night he looked out the window and saw fat, heavy flakes sifting slowly from the sullen clouds overhead. He watched them fall for a few minutes, then said, "Edna? It looks like it's going to be a bad one. What do you think? Would you like me to build a fire?"

"You'd better bring some logs into the garage if it's going to storm," she said. "Yes, a fire would be nice, Frank."

He nodded and went to the closet for his heavy coat. Twenty minutes later, as he stuffed paper under the logs, he said, "It's really starting to come down." They both paused, listening to the wind. Full dark had come, and bits of ice mixed in the snow made scritching noises on the picture window.

Edna said, "What on earth is going on across the street?"

"What?"

"Frank, come look at this."

"Okay, just let me light—"

"No. Come here now," she said.

His knees snapped as he stood up. "What is it?" he said. "I—oh."

At the Northrup place—hard to think of it as the Ning house, the name of the T'chai family—a strange blue glow was shimmering about a foot away from the walls and roof. Slowly, the glow expanded until it protected the entire lot. It was hard to make out, but Frank thought the snow was not falling through the odd shield.

"Oh, Frank," Edna said. "Do you think it's dangerous?"

He looked again. No, the snow was definitely being deflected somehow. He thought of what his own driveway would look like in the morning. "It looks like a damn good idea to me," he said.

It snowed for two days, eighteen inches which blew into six foot dunes in back of the house. Monday the club manager called and told Frank not to bother trying to come in. The temperature had dropped steeply after the storm cleared, and Frank's breath made dense smoky clouds in front of him as he pushed the antiquated snowblower against the shapeless white drifts that covered his driveway. After an hour, he only had a two-foot path to show for his trouble.

"Hello, neighbor," he heard a deep voice call.

He shut off the machine and turned. His legs were sore and cold, and his back ached right up to his reddened ears. He thought longingly of a cup of hot chocolate. "Hi, Ning," he replied, looking enviously at the alien's untouched yard and driveway. "Say, that's a great little gadget you've got."

The big alien stood just at the edge of his own property. "What's that?" he said.

"That blue light thing that kept the snow away."

Ning smiled. His lipless mouth was filled not with teeth, but with what appeared to be small white worms. Frank always tried not to look at Ning's smile.

"The krang? You can pick one up at—oh, I forgot. They're not distributed here yet. Kan-kor-ky company makes them, out of Altair Union. Probably be on the market here within a few months, though."

Frank brightened at the thought. Maybe in time for next winter. "How much one of them cost?" he asked.

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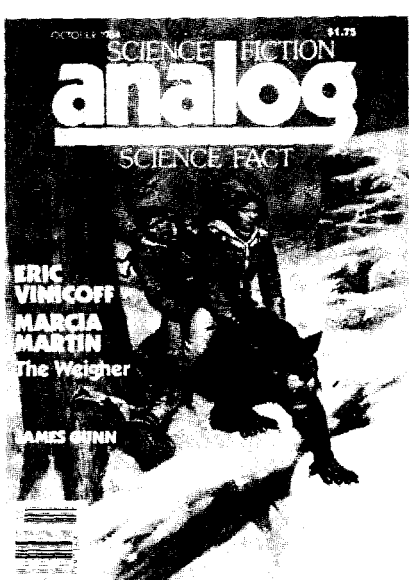

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"Let's see," Ning said. He played with his wrist computer for a second. "About twenty thousand dollars." He noted the look that washed over Frank's face. "I'm not sure I understand what your expression means," he said. "Is that a lot of money for you?"

Frank said, "Yeah. It's a lot of money. More than I can afford."

Ning watched as Frank tried to start the snowblower. "I'll tell you what," he said. "I'm going to buy a new one soon, anyway. Better model. When I do, I'll just give you this one. How's that?"

Frank stood up. "Oh, no, I couldn't—"

"Come on," Ning said. "What are neighbors for?"

At the beginning of April, Frank came home from the grocery and noticed that the sign was missing from the Johnson's front yard. He set the plastic bags on the kitchen table and said, "I see the Johnsons have their sign down. I wonder if they changed their minds? Or maybe they couldn't get a buyer. More likely that."

Edna brightened. Betty Johnson was one of her best friends. "I think I'll call and find out," she said. As she left the kitchen, she said, "Be sure to put the frozen stuff away first."

Frank was stacking cans in the cupboards when she returned. Her eyes were bitter. "They sold, all right," she said. "And it's just what I was afraid of."

"What is?"

"She didn't want to admit it, but I got it out of her. Some more of those aliens." The way she said the word, it sounded obscene. "Something from Xyladon, wherever that is."

The Xyladonites moved in two weeks after that. Edna didn't go over to say hello. The first thing the new arrivals did was paint the house in whirling stripes. The hues were not earthly ones, and it gave Frank a headache to look at the new color scheme. Ning told him they were nice folks, a middle-management hive that was running distribution for an off-world company setting up here on Earth. Ning had just finished roofing over his whole lot with some kind of plastic that rippled constantly, and it wasn't much fun to look at, either. When the barrier occasionally cleared, Frank could see strange shapes growing behind it.

"I can't stand much more of this, Frank," Edna said one day. "Five more houses for sale, and you can guess what will probably buy them. I think we should sell too."

"I've tried to explain," he told her. "This house is all we have. If we sell it, we still won't get enough money to live anywhere else. And where can I get a job?"

She burst into sudden tears. "I know, I know. But all my friends—those things moving in—I just can't take much more!"

Awkwardly, he put his arms around her. "Edna, I understand," he said. "But what can we do? Hope it doesn't get worse, that's all."

She buried her face on his shoulder. "It will, Frank. I just know it will."

All three of the Nings joined the club. There was a long debate, the more conservative members holding out, but Ning, and other aliens like him, had a

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lot of money and weren't shy about spending it. Several donations for fixing up the club rooms, the pool, and the lounge decided the issue, and the Ahwanna Country Club acquired some rather startling new members.

It was a high hot day in July, just after the holiday, when Frank pulled his aging Chevy into the employee's lot behind the main building. The summer had been exceptionally dry; he noticed that the rough on the golf course looked brown and brittle. Happy shouts drifted up from the pool. The kids were out of school and making the most of it.

Frank changed into his white shirt, black pants, and vest in the men's locker room, then went into the bar. The morning man, Fred Larkin, was polishing one of the copper glass racks. He was short, and his chubby face was red from the exertion of reaching that high.

"Afternoon, Frank," he said. He gestured toward the single man at the far end of the bar and said, "Slow day so far. Just Dr. Wallace." Dr. Wallace, a retired dentist, was there every day, from ten o'clock in the morning when he breakfasted on a six-pack of Coors, till midnight, when the bar closed after his last nightcap.

"Hello, Fred," Frank replied. "Anything else going on?"

A worried look flickered across Fred's moonlike face. "I don't know, Frank. Mr. Thornton met with the board all morning. He came out early this afternoon and said he wanted to see both of us when you got in. Do you know anything about it?"

Frank shook his head. He felt a little shiver of worry as he said, "Well, I suppose we'll find out, won't we?"

Mr. Thornton, the club manager, appeared soon enough. He was a short, fiftyish, well-kept man with a receding hairline, sharp features, and a brisk manner. His dark brown suit was finely tailored, his silk tie immaculate. He wore a matching silk hanky neatly puffed in his breast pocket.

"Fred, Frank," he said. "Can I see you both in the office for a minute?"

The two bartenders looked at each other. Worse and worse, Frank thought. They followed Thornton through the kitchen to his cubbyhole in back. The club didn't go in much for management luxury. That was saved for the members out front.

"Sit down," he said, and pointed to the two folding chairs wedged in front of his desk.

Frank sighed. Here it comes, he thought. His stomach fluttered.

"I'll make this short, gentlemen," Mr. Thornton said. "I don't know how to make it sweet. We are letting you go. I just spoke with the board, and they have generously agreed to give you six months severance pay." He said all the words quickly and then stopped, as if glad he'd gotten them out.

"Why?" Frank said.

Mr. Thornton looked annoyed. "I don't have to tell you any reason, Frank," he said, "but we are buying one of those new autobars. An off-planet company makes them. A lot of our members aren't human. You may have noticed. They like to drink things we aren't set up to make. We can buy an autobar and it will make them. So that's your reason. Okay?"

It clearly wouldn't be okay if Frank

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said anything more. "When do we get paid?" he said.

"Right now," Mr. Thornton said. He reached into his desk and took out two envelopes. He handed one to Frank. "Listen," he said. "I'm sorry about this. But what could we do? Times change. Who knows—I might be next."

Frank stared at him. "Yes, you might be," he said. "I sure hope you are."

A faint flush appeared on Mr. Thornton's cheeks. "Look here, Henderson, I don't have to listen to that kind of crap from you."

Frank nodded. "I've worked for you almost ten years. Ever since you came here," he said. "I've always thought you were a jerk."

"Get out of here."

"Sure will," Frank said.

The big storm that had been building in Canada for over a week picked Christmas Eve that year to come howling down over the midwest. Frank kept a cautious watch on the sky, and by ten o'clock that night he had turned on the second-hand krang Ning had given him. Almost all the houses on the street now had some kind of protection, and nobody was paying much attention to the blizzard.

"Should I put another log on the fire, Edna?" he said.

"Whatever you want," she said. Her voice was listless. She had aged considerably over the past several months. She rarely left the house now. Most of her friends were gone, and she couldn't stand to see what now lived in their houses. Frank looked at her as she slumped in her rocker by the lowering blaze, and suddenly, with no warning at all, felt moisture on his cheeks. "I love you," he said.

She turned and stared at him, then smiled faintly. "Yes," she said. "That helps a little."

He tried an answering smile. "Just a little?"

She shrugged.

"It wasn't what I said to Thornton, you know."

She shook her head slightly. They had been over that ground.

"Really. It doesn't matter that he won't give me a reference. There's no place to give a reference to. Most of my kind of jobs are gone, and the ones that are left, those guys can see the handwriting on the wall too. They aren't quitting, no matter what."

She stared fixedly at the fire. "Frank, this is the worst Christmas we've ever had. Worse than when we were first married, just starting out. We didn't have any money then, but we had hope." She nodded. "We could at least hope for something then."

"I'll think of a way," he said.

"How? What? You're right, Frank. There aren't any jobs. Unless you're an alien. I've made up my mind. I want us to sell the house. I know, unemployment, a ratty apartment, all that. But we could at least move someplace I wouldn't have to look at them, know they're taking what once was ours. Our neighbors. Huh. We can't even afford to live in our own neighborhood any more. I don't care what the new place looks like. I could fix it up. I know it's not your fault, Frank. It's theirs. But we can't do anything about them, can we? So let's just go."

Somehow, without knowing how, he

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knew that she had given him the answer, but for the life of him, he couldn't figure out what it was. And the thought of giving up their last bit of security made him feel sick to his stomach. "Well, I guess we could talk about it," he said.

She turned and looked at him again, this time a real smile lighting her face. "Could we? Just see a real estate agent, Frank. I don't care how little we can get for the house, it will be enough. We'll find a way to make out."

He walked over and touched her lips with his finger. "Okay, tomorrow. No, everything will be closed on Christmas. First thing Monday, I'll look into it."

She kissed his finger. "Maybe it will be a good Christmas after all."

Christmas morning was hard and cold and bright. Frank turned off the krang as soon as he got up. The street in front of the house looked about five inches deep in snow, but it hadn't drifted much, and it looked drivable.

"I'm going to try to get up to the store and buy the fixings for dinner," he said as he finished his second cup of coffee.

"Just be careful," Edna said.

"I will," he said. They didn't need to mention how little of their meager savings remained. They both knew, almost to the penny.

The store was crowded. About two out of every three patrons were from off-planet. Most of the aliens had adopted terran holidays, and there was a festive mood in the air. Frank winced every time he put something new in the cart. Prices had almost doubled in a year. One of his friends had explained it to him. Inflation was caused by too much money chasing too few goods. The aliens had lots of money. So prices went up wherever they were.

Where can we go? he wondered. He'd seen on television that it was even worse in the large cities. Maybe some small town, some place where bizarre creatures hadn't bought everything and started fixing it up to their own specifications. Someplace where humans could still live a decent life without paying a fortune.

It made his head ache to think about it. It made a loose, floppy feeling in his gut. It made his knees weak. Now we're all in the trap, he thought.

As they bagged up his small order, he heard a voice rumble, "Frank! Merry Christmas!"

"Hi, Ning," he said.

The big alien pushed a cart piled high with groceries over to him. "I love your terran holidays. We don't have such things. I wonder why not? It's a great idea."

Frank grinned faintly. "Merry Christmas to you, Ning. Glad you like it."

Ning had learned something about terran facial expressions. "What's the matter, Frank? You don't look very happy."

"I guess I'm not. Nothing you can do. It's just that I'm going to have to sell the house. I don't want to, but that's the way things go."

"Sell the house? Why do that?"

"I don't have any money, Ning. No job, either. The house is all I've got to live on."

Ning's eyes, three brown, light-sensing spots surrounding his mouth, changed color slightly. "That's terrible, Frank. I had no idea—" He glanced at

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his sagging cart. "Listen, I've got to get this stuff home, but why don't you come over this afternoon? We can have a drink and talk about it."

Frank shrugged. "Sure. Why not?"

"Good. See you about four?"

"Okay," Frank said.

Christmas dinner was mildly depressing, with Edna chattering about how nice their new place would be, how normal and likable their neighbors would turn out. Frank was afraid that the world had passed her by, and he was worried about what would happen when these airy daydreams crashed in the disheartening light of reality. He helped her carry plates and dishes to the sink. She always rinsed them carefully before she put them in the old dishwasher. You didn't have to do that with one of the new sonic models.

"Ning asked me over. I told him about the house," he said.

Her knuckles reddened as she pressed hard on a plate. "Why would he care?"

"I don't know. But I said I'd talk to him."

She set down the plate with more force than necessary. "Maybe he has a friend who's looking for a place to buy."

"Maybe," he said. And the way out opened up before him like a tulip caught unawares by spring.

The possibilities were still bubbling in his head as he stood before the shield surrounding Ning's property. I wonder what his old neighborhood was like, he thought.

"Come in, Frank," Ning said. A piece of the shield had irised open, and the big alien was motioning him forward.

Frank choked back the urge to stop and stare. He had never visited Ning after the first day. The Northrups would not have recognized their old place. Walls were missing, and part of the roof. A riot of strange, blue-green vegetation grew in and out of the house, seeming to make no distinction. Great leaves bent gently before a sourceless wind. The lighting was subtly off, just a bit brighter than it should have been, so that shadowy razors played mumblety-peg in the corners. The odor of violets was overpowering.

Ning settled himself in the crotch of a huge, umbrella-like plant which covered most of what had once been the front porch. Two silvery devices, apparently growing from the ground, were at his right hand.

"Sit down, Frank. Care for a drink? Don't worry, I've got Earth booze. I like scotch, myself. How about you?"

"Scotch is fine," Frank said.

"Good." Ning touched one of the silver machines. There was a low, clear tone and two drinks appeared on a tray atop the other machine. They sipped their drinks for a moment.

"This place sure looks different," Frank said.

The worms in Ning's mouth became rigid, then relaxed. Frank knew it was the alien's equivalent of a show of pleasure. "It took a lot of work, but we've just about got it right. Lucky things are so cheap here."

"Well, I guess things are usually cheap for an alien, aren't they?" Frank said.

"What do you mean?" Ning asked.

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"What I want to talk to you about," Frank said. "Just an idea I had. Maybe we can help each other. . . ."

The small being that looked quite a bit like a red bunny with orange eyeshadow and chicken feet made some high-pitched whistling sounds. Two weeks of hypno-packing and some throat surgery had made Frank equally proficient in the language. All at company expense, of course. A part of him still thought of the grotesque rabbit as an alien, but he repressed the thought. He was the alien here.

It was a nice piece of luck that this planet was so primitive none of Ning's more sophisticated salesmen wanted to open the branch here. But it was economics, not luck, that led to Ning's company purchasing his old house for half a million terran dollars. He'd never stopped to think about it, but all the renovation his neighbors had done had made the house much more valuable to others like themselves. Ning said he figured to make a nice little profit on it.

He and Edna were standing beneath a pink sky, looking up at a mass of black vegetation thickly covering a steep hillside. A very large log structure rambled across much of the base of the hill.

"Used to be the chaCan place," the rabbit was saying. "Good, solid house. A bargain, too."

Frank nodded. He turned to Edna and said. "Well, what do you think?"

The hardest battle had been convincing her. Success had taken something uncomfortably close to brutality, but she had finally understood the misery of their other options.

"It's the best one we've seen so far," she said. "If only our neighbors—" She glanced meaningfully at the rabbit.

"We'll have a whole branch office here soon," Frank said. "Mostly human, I imagine. The climate's perfect for us, not so good for a lot of the others. Don't worry, you'll have your neighbors."

"I do like the location," she said.

Frank turned to the real-estate agent. "How much?"

The rabbit named a figure. About six federeds, Frank thought. His base was five a month. Plus commission. The chaCan place was ridiculously cheap.

"We'll take it," he said. He looked at Edna. She smiled.

"Look, Frank," she said. "We can put a swimming pool right there."

Frank nodded. He wondered if terran grass would grow. Somehow, he thought it probably would. ■

● That which enables the wise sovereign and good general to strike and conquer and achieve things beyond the reach of ordinary men is foreknowledge.

Sun Tzu, 500 B.C.

Submitted by G. Harry Stine

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Dr. Robert L. Forward

ACCELERATION CONSTANT

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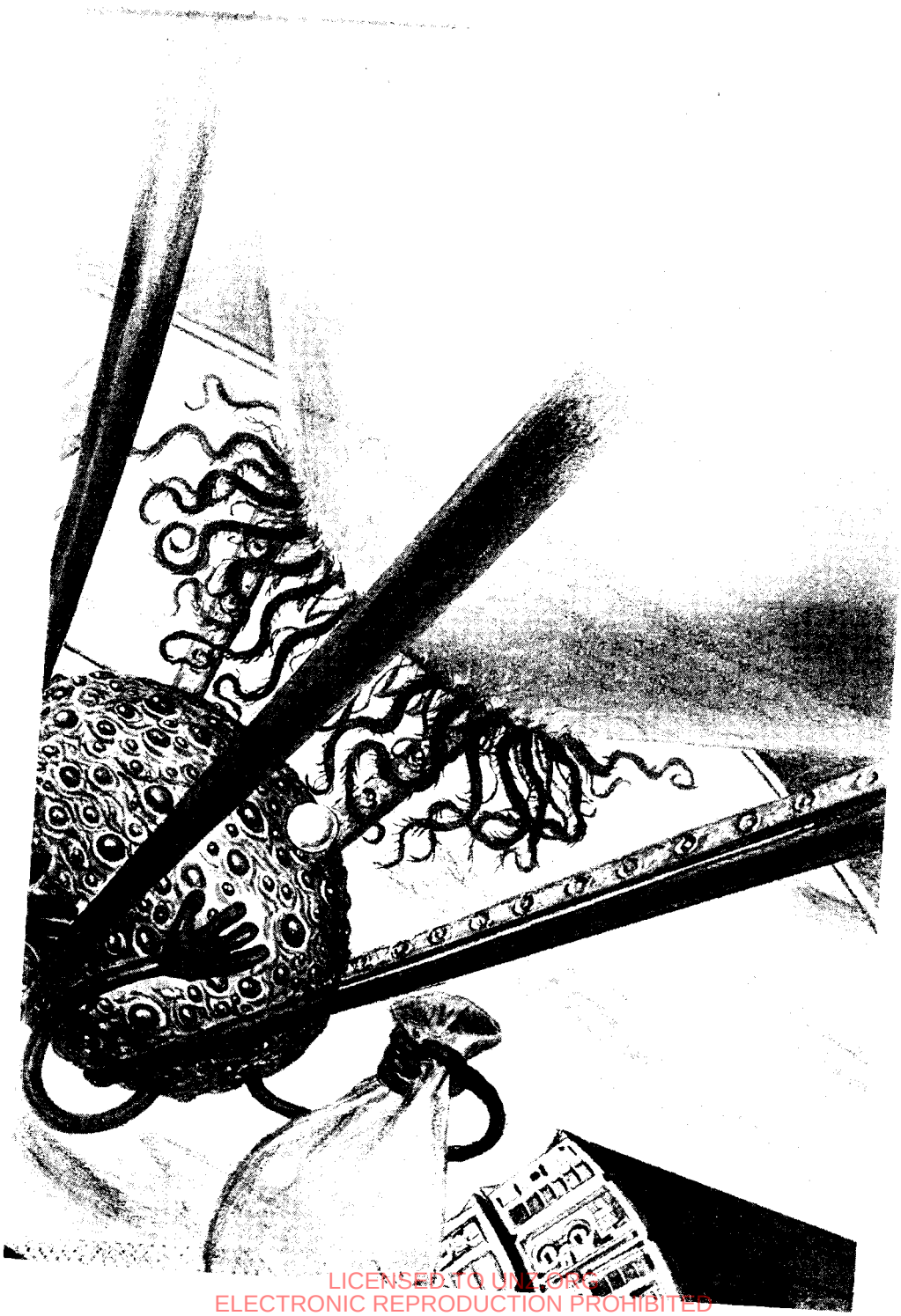

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I was embarrassed.

I was living a cliché right out of the old science fiction pulp thrillers —beautiful heroine clad in a scanty plastic spacesuit in the clutche of a Bug-Eyed Monster.

I swallowed my chagrin and puzzled over my predicament. I was in the capture-hold of the Borcs' strange conical spaceship. The hold was in vacuum. I had a suit on, but it was a sports model with only a half-hour tank. I looked up at the alien being on the other side of the crystal ceiling. Its myriad of lidless eyes stared at me—unblinking.

As the Borc ship kept up its constant acceleration of 2.8 times Earth gravity I began to worry. At constant acceleration I was getting farther and farther away from Earth and any possible resupply of oxygen. Would they stop to let me out? I was afraid not—for Borcs never stop.

The constant acceleration was the first thing the Belt Traffic Control computer noticed about the ship as it dived in from deep space. By the time the radars had picked up its presence in the distant fringes of the asteroid belt, the speed of the object had exceeded the velocity of any of the planets—yet it continued to accelerate. The computer activated an often-tested but never-before-used alarm.

"ALIEN SHIP DETECTED!" modulated the cool mechanical voice.

I had been visiting the Chief Traffic Controller, John McManus, while my ship was being refueled. John used to be a rock-hopper like me, but had to give up prospecting and take an inside job after his legs got chewed up between a couple of million-ton asteroids.

When the computer alarm sounded I floated to the back of the control room and watched the professionals go to work. The constant acceleration of the unknown ship made it easy to analyze where it came from. Yet that very consistency was puzzling. No one ever ran a ship at high acceleration. It was too wasteful of power.

The controllers traced the track of the ship back along its course. It had come from Jupiter—in a straight line toward the sun—never deviating from a constant 2.8 g.

"How fast is it going now?" I asked.

One of the younger controllers replied without taking his eyes off his screen, "Over 100 kilometers per second, Miss Vengeance." As he spoke, the spot on the screen curved in a broad arc, then continued to plummet inward toward the sun.

John gave a soft whistle. "A J-hook turn—every centimeter of it at constant acceleration. First they go hell-bent-for-leather straight at the sun, then swoop around in a big arc until their tail is pointed backward. Now they are slowing down by applying acceleration in the opposite direction. I wonder where they're going to stop?

As John spoke he was punching a keyboard. Soon a blow-up of a section of the asteroid belt was on the screen. There was a flashing X that showed the place where the alien ship was heading.

There was nothing at that point. However, the pattern of large and small asteroids around the blinking X were familiar to me. The aliens were approaching the region where I did my

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prospecting. I knew the territory well, for that was where I hopped from rock to rock in my ship, *The Billionaire*, looking for the one rock in hundreds with enough iron and nickel in it to make it worth dragging back to the Belt Processor.

A year ago I had been lucky, and had found a huge, high-nickel asteroid. Now my ship's name was more of a brag than a wish, but I still kept prospecting. I guess it was in my blood.

Suddenly everything clicked, and I blurted out, "John, that spot is where I made my big strike! You remember —the asteroid that had the cloud of ultradense midges in a bouncing orbit that went back and forth through it."

"The fast-living ones that the scientists think are intelligent, but who won't talk to us?" he asked

"Yes," I said. "Perhaps this ship contains more of the midges and they are looking for their friends."

"I doubt it," said John. "If I remember, those gnats couldn't stand one g, much less 2.8 g." He returned from his screen, and with a thoughtful frown asked, "Say, Red. While we're busy tracking this ship, would you go to a spare console and look up the surface gravity of Jupiter in the library files?"

The computer confirmed John's hunch. "There is no real surface on Jupiter," I reported back, "but the gravity deep under the top cloud layer is 2.8 Earth gravities."

"I thought so," said John, "Whoever those beings are, they like home so much that they even brought their own gravity. I guess they don't like free-fall."

"Maybe it's unhealthful for them," I said, hitting closer to the mark than I realized.

Earth was warned, but there was little that could be done except to alert the various national police forces, who dug out ancient codes and disentombed some nuclear warheads. There was no panic, for one alien ship poking about in the asteroid belt does not make an invasion.

John and his assistants scanned their wide-angle screens, seaching for some belter who could get a close glimpse of the alien craft, but none of the prospector or scientific ships was in position. The radars tracked the alien while it approached the empty spot in space where my asteroid used to be.

I thought they would come to a stop and look around, but I forgot their penchant for constant acceleration. The ship approached the rendezvous point and, not finding the asteroid, changed course and took off again. This time they went along the asteroid belt instead of across it—still at 2.8 g.

"They must be looking around the belt for the asteroid," said John. We continued to watch as their speed increased to higher and higher velocities under the constant acceleration.

"They are well over 200 kilometers per second now," said the young controller after an hour, "and they are still accelerating. At that speed they are going to go flying off into space!"

"Look at your computer readout," said John. "They have pointed their exhaust just enough to keep them going in a big circle about the sun."

The refueling of my ship was complete. My original plan was to go back out into the belt to do more prospecting,

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but I had received an urgent call from my publisher. My book, *The Singing Diamond*, in which I had described my adventure with the rich asteroid and its buzzing swarm of fast-living creatures, was starting to slip in the lists. These new aliens, who seemed to be interested in the whereabouts of my midge cloud, were in all the news and the publishers wanted me to come back for some publicity shots. When I left Belt Central the next day, the alien ship was still accelerating, although most of its acceleration was now going into keeping it orbiting in the asteroid belt rather than increasing its speed.

As I poked along toward Earth with my anti-matter fueled "water-torch" drive, the alien flashed around the asteroid belt, each orbit taking only nine days instead of an asteroid's five years.

I had a great time on Earth. Although I really don't care for crowds, all those lovely people were making me even richer than I already was by pushing my book back up to the top of the best-seller lists. I went to autograph parties, had countless interviews, was seen in the best restaurants, and made my second appearance in one year on the "Tomorrow" show.

While I was having fun, the aliens continued to search the belt. A few scientific ships had been able to get close enough to the trajectory of the alien craft to take pictures while it came flashing by at 1/90 the speed of light. The intruder ship was a 30-meter-high cloud-gray cone. The back end—where we expected to see huge rocket nozzles emitting a flaming exhaust—was black. The smoothly rounded surface showed some evidence of a door hatch, but little else. If the scientists had been intrigued before, they were excited now. The aliens didn't use rockets!

After going around the asteroid belt a dozen times, the alien ship changed course and came toward the Earth. The Earth authorities started to get worried, but the panic was over before it got started. At 2.8 g, it only took the aliens a few hours to switch from an asteroid belt orbit around the sun to a polar orbit around the Earth. But again, what a strange orbit. They flew at 30 kilometers altitude! Neither airplanes nor space interceptors could keep up with them.

There is not much air at 30 km, but enough for the aliens to produce a continuous sonic boom with their 16 km/sec velocity. They circled the Earth every 43 minutes, their outward pointing invisible jets augmenting the Earth's gravity pull so that their ship stayed at 2.8 g constant acceleration.

With the aliens in sight (and sound) overhead, the publicity people for my book went into high gear. They arranged a photographic interview with *Anybody Who Is*, the photo/video news magazine that makes and destroys public personalities with the flick of a video editor's erase pen.

The photographer assigned to me was a professional, with an expense budget to match. He wanted a shot of me at the San-San zoo, sitting next to my swarm of gnats swirling in free fall inside their diamond cage with its gravity trap.

Instead of the usual "pretty girl admiring a diamond in a skimpy dress" shot, the photographer decided to have me wear a space-suit, for that was what I was wearing when I first encountered the pesky little swarm. However, true

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to the code of the photographic journalist, my own deep-space work suit would not do. We went to "Vacuum Sports," a small specialty store situated in the recently renovated area of old downtown Beverly Hills.

I've got to admit the suit looked good. It was designed for light travel and games in the vacuum tunnels and caverns of the Moon, asteroids, and orbital stations. It had a modest propulsion pack for free-fall games, and a half-hour supply of air in a super-pressure tank. However, it ommited such niceties as food, water, and disposal facilities that are essential in a real work suit. The feature that sold the photographer was the tough, transparent plastic film that stretched from boots to hips and wrist collars to upper torso, with a bare midriff effect between.

We went back to the zoo and the photographer started to arrange the pose. I had my helmet on, and had it pressed against the side of the barrel-sized diamond. In the center of the diamond was a flat plate of ultra-dense matter—four million tons of it. The plate was the gravity trap that our scientists had made to capture the pesky little midges bouncing back and forth through my asteroid. The diamond casing was to keep the ultradense matter in the plate from expanding back into normal matter. The matter was so dense that the gravity of the plate was one g on each side. But since the Earth was contributing its own gravity field, there were two g's on top of the disc, and zero g underneath. The one-g downward pull of the Earth was canceled by the one-g upward pull of the plate.

The cloud of dense gnats swirled in the free-fall region below the disc. As the dense bodies of the tiny midges moved through the ultra-hard diamond like it wasn't there, the crystal would protest with a singing sound.

We didn't realize it at the time, but while we had been shopping, the sonic booms from the alien ship had stopped. The aliens had left Earth orbit and gone out in a wide arc that would bring them down at high speed directly toward the San-San zoo.

As the photographer was setting up his lights, the alien ship was descending toward us—its invisible engines slowing it down from its immense speed. I was all posed, mentally saying "cheese" through the fishbowl of the helmet, when the ship came upon us like a runaway elevator.

I looked up at the sound of rushing air to see the blunt end of the alien craft drop down the last 20 meters. It came to a momentary stop just above my head—then took off again—all at constant acceleration.

In that split second while the ship was nearly motionless, a pair of long mechanical arms reached out of an open hatch to grab the barrel-sized diamond. The arms flipped the gem upside down, trapping the swarm of specks on the dense disc encased inside. As the arms pulled the diamond toward the hatch opening, the huge crystal rammed into my midriff. Together the diamond and I were scooped through the cavernous doors in the base of the ship.

The hatch closed. I looked upward in the 2.8-g acceleration to see a strange sight above me. Floating in a slightly bluish liquid on the other side of a large glass viewing port were a group of min-

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iature hot-air balloons. Each had a spherical orange gas-bag about a meter across. Where the neck of the balloon would normally be, there was a number of short tentacles encircling a mouth with many sharp-looking triangular teeth. Hanging by six long, violet cords from the topside of each balloon was a smaller, heavier gondola part. These were purple, with four short tendrils hanging down. There were large and small black spots all over the purple bodies.

I pried myself off the diamond and slowly lowered my heavy limbs to the floor. I tried sitting up, but the weight of the backpack was just too much in the 2.8-g acceleration. I carefully lay on the floor and turned my head to look upward through the thick clear ceiling at the beings floating above me.

There were four of them. Three were smaller, with yellow-orange gas sacs and a bright violet lower body. They were constantly in motion, moving from one control panel to another, the splayed tips of their lower tendrils flitting over the illuminated buttons on the wall panels. The fourth being was a slightly larger creature, with a dark orange balloon and a gray-violet underbody. It was now hovered right over the viewing port. One of the tendrils carried a small weighted sack, and another tendril was pulling tiny yellow spheres from it. The tendril would reach up into the space between the upper body and the lower body and release the small ball. It would shoot rapidly upward and would immediately be captured by the tiny eating arms hanging beneath the orange globe, to be pierced and devoured by the slashing triangular teeth.

After finishing its lunch, the larger creature went over to a trapezoidal platform with buttons on the sloping sides. It lowered itself on the flat top of the trapezoid and let its four tendrils hang down around the sides. The fine "fingers" at the end of the tendrils played among the buttons and one of the four large arms in the hold lifted from its fixture and swung toward me. Carefully cradling my body in the high gravity, the arm lifted me up until I was just underneath the crystal ceiling. I was able to move my helmet so that it could touch the glass. I could now hear.

There was an overall hum that ran through the ship like an expression of controlled power of enormous magnitude. That must be the invisible engines that somehow kept the ship at constant acceleration. I could also hear high pitched chirps and twitters. These seemed to occur when I could see surface vibrations on the violet portions of the creatures. Being liquid-based, it was obvious that they used some type of sonar for communication. However, the liquid was not water, but ammonia, hydrogen, and methane gas under thousands of atmospheres of pressure.

I lifted a leaden hand and felt the glass. It was hot to the touch. Although Jupiter is farther from the sun than Earth and gets less sunlight, the planet itself emits heat from inside. These creatures must live down where the temperature is slightly higher than normal Earth temperatures.

Suddenly the larger creature released a particularly large bubble from its orange gas-sac and shot over in my direction. As the bubble left its body, I heard a flatulent "Borc!" The being

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then used finger jets of gas until its double-lobed body was hovering right above me, its myriad of jet black eyes staring unblinkingly at mine—one foot and thousands of atmospheres away. It was then that I recognized the musty old cliche I was living out.

The being twittered at me. There was no way that I could imitate the nearly inaudible high-pitched sounds that came from its body, so I replied with the only sound that I could vocalize.

"You—Borc!" I said, feeling like a cartoon character.

There was a moment's pause in the twittering. I was afraid that I had committed a breach of Borc etiquette. I then decided that since I could not vocalize its language, I would have to get it to try mine.

"I am 'Red' Vengeance," I said.

"I am human. I need to get some air in twenty minutes or I am done for!" I went on, knowing full well the conversation was fruitless. The larger Borc tried some human speech using its gas bag jets, but the best it could do was to get the rhythm.

I was beginning to lose hope that they would understand my predicament in time, when I felt a subtle shift in the gravity forces in the ship. The maneuver was done fairly smoothly, but I could tell that the ship had stopped accelerating in a straight line away from Earth, and was now moving into a circular path. Again, the centrifugal force of the circular path was such that there were always 2.8 g's toward the base of the ship.

I was not the only thing that felt the slight unbalance in forces as the ship shifted into a circular orbit. The four million ton diamond did also. The weighty cargo slid to the other side of the hold. As it moved, the ship swerved wildly as its unseen engines attempted to adjust to the shifted load. There were rapid changes in acceleration, and for almost a full second we experienced free fall. I watched as the Borcs above me were tumbled about by the swirling currents in their control room. One of the smaller Borcs was thrown into its gas sac. When the two parts of the body separated again, there was a violet dye staining the bluish liquid from where its lower body had banged into its teeth.

"OUCH!" I said in sympathy, "I bet that is the Borc equivalent of falling on your chin and biting your tongue!"

But the injury was more serious than that. The larger Borc stayed at the control panels, bringing the still wavering ship under control, while the other two gathered around their injured comrade. The lower violet body was limp, but the yellow orange top was still flailing its stubby feeding tenticles. It seemed to be trying to grasp the six tendon-like strands that arched over its top. The two uninjured Borcs pulled thin silver tubes from recesses in the control room wall and aimed them at the writhing yellow balloon. I heard shrill sounds and watched, horrified, as the gas sac portion of the injured Borc's body was torn to shreds by the ultrasonic lances from the tubes. The Borcs were careful, and only the yellow-orange portion was subjected to the disintegrating power of the beams. Soon the six violet cords were lying on the floor around the sluggishly moving lower body, their only discoloration a raw-looking orange-violet stripe near the tip.

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One of the tube-carrying Borcs jetted over to a cage-like compartment in the far wall. In the case was a cluster of what looked like orange rags. The Borc did something with his tube through the holes in the door, and then opened it quickly to remove a limp, nearly deflated orange balloon. The ring of teeth and the feeding arms were motionless. In its deflated state I could see the top of the bag. There were six nozzles there, each emitting tiny bubbles of gas that floated quickly up to the conical ceiling. The nearly empty gas bag was held on the floor next to the recovering violet body, and the six long thin arms each grasped one of the six gas ports, shutting them off.

The Borc that had been holding the gas bag down to the floor now allowed it to rise. After a few minutes with its valves shut, the orange bag was floating in its normal position above the violet body, with the six long arms under enough tension to keep them away from the tentacles and teeth of the bag. The revived Borc stayed there, feeding its now awake and ravenous symbiote a supper of baby balloons. Slowly the orange sac expanded, turning a translucent yellow-orange as it did so.

I now began to realize what I had seen. No wonder the Borcs always traveled at 2.8 g's. They had to—or they would be eaten alive! The Borcs consisted of an intelligent spider-like violet creature that captured and controlled a vicious semi-intelligent orange gas balloon which served as its float. I looked more carefully at the violet body and could discern no evidence of any kind of eating port. The symbiosis must have been going on for a long time, for it looked as though those six long arms reaching up to grasp the orange balloons in a dangerous embrace were not just for control of the gas jets. The raw looking orange-violet stripes on the arms were suckers.

Well—the Borcs had their problems, but I had mine. I had only ten minutes of air left. I started banging on the glass window to get their attention. They had not forgotten me, however. The hatch below me opened. There was only the clumsy mechanical arm between me and a whirling, empty sky. They were going to throw me out!

I am afraid I screamed a little as I grabbed the arm around its mechanical wrist and held on tightly. The arm reached out the hatch and around to the outside of the ship. It was an amazingly long, articulated structure. (It would have to be, I thought. Any outside repairs would have to be done with these arms, since a Borc would not dare put its two antagonistic halves into the close quarters of the same spacesuit.) Holding me carefully against the g forces, the arm carried me up to the pointed nose of the ship and beyond. As we traveled upward, the g forces became less and less. Finally, about three meters past the nose of the ship, the arm gave a little toss, and I found myself floating in free-fall.

Around and around me at about 40 meters distance, the Borc spacecraft was whirling in a close orbit, with me at the center. It took about six seconds for the ship to make one complete orbit. It was like watching a giant toy on the end of a string that I whirled about my head, but there was no string. The invisible

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jets from the spacecraft supplied the force that the missing string could not.

I squinted outward through the glare of the sun and saw the welcome sight of one of Earth's synchronous orbit communication stations a few hundred meters away. With a sigh of relief I moved my left hand to the jet-pack controls on my chest and did a fancy barrel-roll toward the welcome space-suited figure exiting an open port on the station.

"Greetings!" I boomed through my suit-mike as I skidded to a full-jet stop not one meter from my new-found friend. "Got any spare air?"

"Miss Vengeance!" exclaimed the nearly invisible visage behind the well-tinted visor. "Get in here quickly! Those sport suits were not made for deep space work; you'll get sun-burned."

I'll never forgive that photographer for making me switch from my regular work suit to the sports model. I was burned everywhere the suit was clear, and that suit had a lot of clear area. Having a red-head's complexion didn't help any either. By the time I recovered, even my freckles had freckles.

After staying long enough to make sure that I was rescued, the Borcs broke from their 2.8-g circle and headed in a 2.8-g straight line for the asteroid belt. By the time a few scientists and I got out to the belt with our dolphin translator computers and sonar generators, the gnats were once again in a small cloud about ten centimeters across, their dust-speck sized ultradense bodies bouncing back and forth through the iron and rock of an asteroid as if it were a vacuum. Circling the asteroid and its buzzing cloud, the Borcs waited for us in one of their constant-g orbits.

We came out prepared to spend as long as necessary learning how to communicate with the Borcs. However, the Borcs had their own translator—the mites. They had had plenty of time in the zoo to observe the human race and learn its language. (Although they had never let on.)

As we approached, we saw the bottom of the Borc ship open again, and one of the mechanical arms threw out a flat sheet of metal. As we exited our port to examine the floating plate, we saw the swarm of flashing specks rising up out of the surface of the asteroid in front of us.

"Stay away from those bees!" I warned. "They won't go out of their way to get you, but they sure sting if you are stupid enough to stand in their path!"

We watched as the swarm passed through the metal plate. It seemed to me that their activity increased as they did so. Our chief scientist and linguist, Abdul Battu, retrieved the plate. He looked at it, smiled broadly, then passed it to me.

"It's for you," he said.

I looked down at the plate. It was covered with tiny little holes. The first batch formed large block letters, which got progressively smaller and smaller until the rest of the plate could only be read through a microscope.

"WELCOME! MISS VENGEANCE," it said, "WE ARE GLAD THAT YOU WERE NOT HURT BY OUR CARELESSNESS. . . ."

"Well—having an ultra-fast translator is going to make things easy," I

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said. "I wonder why the bugs talk to the Borcs, when they never would talk to us?"

"I suspect that somehow they belong to the Borcs," said Abdul. "Let's get that plate inside to a microscope and see what it says."

Well—it turns out that the Borcs are a very, very old race. They have fully developed some areas of science, but were limited in many others because their planet has no solid crust and their strange physical makeup limits their space travel to constant acceleration missions.

Their space drive is a marvel of elementary particle physics. The Borcs have completely unraveled the mystery of how one elementary particle turns into another. They use anti-matter to power their engines just like we do, but instead of their anti-matter turning into pions and gamma-rays as it does in our "water-torch" engines, they somehow control the reaction so that the annihilation of the anti-hydrogen and the normal-hydrogen always produces two identical high-energy neutrinos, with no energy lost as heat or gamma rays. Their control is so complete that the two neutrinos both shoot off in the aft direction, while kicking the ship in the forward direction. Since neutrinos, once formed, can pass right through almost anything, the Borcs don't bother with rocket exhausts—the unstoppable neutrinos just shoot right out through the base of their ship!

After a few days, my first-hand knowledge of the Borcs became less useful to the scientists. I now spent my time in the lounge, poring over some new gravity and thermal survey maps covering my claim in the asteroid belt. I was planning my next prospecting trip while waiting for the shuttle back to Earth and my ship.

Abdul was going through the fifteenth information plate when he finally learned why the Borcs had the swarm of midges. He told me about it one evening while we were relaxing in the lounge. He looked great in a white silk jump suit and turban, his piercing black eyes peering out from his jovial bearded face. I had on my electric-blue feather-dress, and was having a hard time keeping the artificial feathers out of my face in free-fall.

"It's amazing, Red," he said. "It turns out that the bugs are a computer. An intelligent computer made of manufactured—but living—ultra-dense beings that live a trillion times faster than either humans or Borcs."

"I guess you need a computer like that if you are going to design neutrino drives," I said, sipping slowly at a Borc Bombshell floating in front of me. I eyed the two squeeze-bulbs that had been strung together with threads, and switched the straw from the violet colored bulb to the orange one. The whole idea was to down both of the equally potent drinks without letting the two bulbs drift together through room currents or your mishandling of the straw.

"Well," said Abdul with some hesitation. "The problem the older Borc had given the bugs was one that takes a lot of computer time to solve, but it really wasn't very important."

"What!" I said. "The Borcs went to all that trouble just to play games?"

"I am afraid so, Red," he said. "The

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Borcs have a game that is very much like 3-D chess. Now—it has long been known that any game like chess, which has no random factors, should allow the person who makes the first move either to win or force a tie—if you only knew the right moves to make. Yet to date, no human-made computer has been fast enough or smart enough to figure out the moves even for our 2-D chess. A good thing too—for it would spoil the game of chess forever."

He paused, took a careful sip from his squeezer of hot mint tea, and continued, "The older Borc was a runner-up in a 3-D chess tourney on Jupiter. He was annoyed, and being rich and powerful, he made a computer and set it to work on the problem of how to never lose. According to our estimates, he started them working 6,550 years ago. He would come out to check on their progress every 50 years or so. This time when he arrived, he found that you had trapped his bugs and stolen his asteroid."

"You mean the larger Borc is over 6,000 years old!" I exclaimed.

"More like 15,000 years," Abdul replied.

"Fortunately he has his bugs back, so they can continue to work on his problem," I said.

Abdul laughed. "It turns out the bugs had solved the problem not too many years before you trapped them. They were waiting for the elder Borc to return so they could give their final report. He has it now."

"I bet he is anxious to get back to Jupiter so he can win in the next 3-D chess tourney," I said.

"No, I am afraid not," said Abdul, with a rare frown. "As I said before, once the answer is known, there is no more challenge to the game. I don't know how a distraught Borc looks, but I bet he is about ready to let his gas sac eat him from the tone I am getting from our correspondence. He doesn't even want to go back to Jupiter. He liked the game so much—and has ruined it so completely for himself—that he is afraid that he will unwittingly reveal the strategy that the bugs worked out for him. Once he does, the game will be ruined for everyone else. He is afraid of what will happen to their culture, even their civilization, with such a fundamental element gone."

"But he can't stay here forever," I said. "Even with their super-efficient neutrino drive, he is going to run out of fuel sometime."

"He can stay here and get the 2.8 g's he needs to survive by splitting his spacecraft into two parts and rotating them on ends of a tether," Abdul said. "But sooner or later he will run out of energy and have to go back to Jupiter."

Suddenly I had a brainstorm. "I know a way," I said. "It will take a lot of time and effort, but I think we can make a comfortable home away from home for our Borc friend—right on Earth."

It did take time—two years in fact. We found a field of granite boulders in the Australian outback with nobody around for hundreds of kilometers. Capsules containing laser-beam suspended antimatter were brought in from the production facility out in the belt. The antimatter was used explosively to compress hunks of granite and carbon into ten centimeter hexagonal tiles of ultra-dense matter encapsulated in diamond. The

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half-million ton slabs were laid in a compact pattern on the flattened top of a large granite knob until nearly one thousand of them had tiled an area three meters across. The thickness of the ultra-dense matter had been adjusted until the gravity just above the plates was 1.8 g's. When the 1-g field of the earth was added, the resulting gravity would keep any Borc from "biting his tongue."

Two years later, I was in the welcoming contingent that stood in the hot December sunshine of "Down Under," awaiting the Borc elevator. The conical ship came screaming out of the sky—right on schedule. My old friends, the mechanical arms, reached out the open hatch. Three arms struggled with a large, clear, cylindrical pressure capsule filled with blue liquid, a lot of machinery, and a violet and orange Borc. The other carried a much smaller cask of diamond with its cargo of gnats.

"He brought his translator," I said.

Just as quickly as it came, the spaceship elevator left again, pulling g's straight for Jupiter. We have a lot to learn from this willing exile and his talking super-computer. If he can only hold out as long in Australia as he did on Jupiter, it shouldn't be too many millennia before we can take our neutrino drive ships down into Jupiter itself—and then, comfortably ensconed in our gravity-controlled cabins—return the visit. ■

IN TIMES TO COME

● Our April issue offers one of those curiously diverse collections of stories and articles. Charles Sheffield's cover story, "Trader's Blood," is a new entry in his "Trader" series which started here a few months ago. Please note that that doesn't mean it's a "sequel"—it's set in the same universe, but it stands on its own, with its own characters, setting, and situation (except one). Part of this Trader's problem is survival, not surprisingly; the rest consists largely of figuring out exactly what the rest of the problem is. Which is, of course, a strict prerequisite for recognizing a good solution. . . .

The other fiction includes, in addition to the conclusion of Frederik Pohl's *The Coming of the Quantum Cats*, a Somtow Sucharitkul tale set in the author's native Thailand and featuring an entertaining collision of at least *three* alien cultures, two of them originating right here on this planet. And Steven Gould is back with a tale having the dubious distinction of being not all *that* much longer than its own title—but fun to read.

George Guthridge's fact article is based on his personal experience in a rather unusual kind of education. There's a common tendency in the "Lower Forty-Eight" to think of such cultures as the Eskimo to be quite removed from "modern civilization." But Guthridge's Eskimo classes have been doing very well indeed in a unique competition which is not only modern but explicitly future-oriented. The secret? Simply the strengths they derive from their own culture—plus a teacher who has learned to recognize those strengths and guide them in new directions.

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on gaming

Dana Lombardy

In *Star Trek II: The Wrath of Khan,* the movie begins with the starship *Enterprise* commanded by a young female Vulcan. The *Enterprise* is lured into an ambush and apparently destroyed by Klingon ships. The "battle" was actually a simulation—a training exercise to see how prospective commanders would handle a no-win situation. This training exercise was known as the "Kobayashi Maru" scenario, and only one cadet (James Kirk) had ever "beaten" the computer in the history of Starfleet Academy.

Now a subtler, more complex scenario has been developed to test Starfleet cadets. It's *The Kobayashi Alternative,* a new text adventure computer game from the Computer Software Division of Simon & Schuster Inc. (available where computer games are sold, or write to 1230 Avenue of the Americas, New York, NY 10020).

The adventure centers around the rescue of the *USS Robert A. Heinlein,* a starship that broke off communication under suspicious circumstances during an exploratory mission in an area known as the 145 Trianguli. The *Heinlein* was in the temporary command of Captain Hikaru Sulu, former navigator of the Enterprise. For Kirk and his crew, this gives the mission a personal importance as they seek to rescue their former helmsman.

To assist you in your mission, the information booklet gives a wealth of detailed information in a highly readable style. However, it doesn't tell how this information translates directly into the game. You must extrapolate from raw data, which adds to the challenge. As the introductory letter to Kirk states, this scenario requires more than heroism. It tests observation, accurate evaluation, and multi-level synthesis, not to mention sheer endurance, empathy, and humor. Keep that in mind while reading the information booklet in order to draw the maximum amount of data from it.

The information presented covers a wide gamut in a few pages, ranging from expected recovery time in sick bay based on the seriousness of the injury, to personal biographies of Kirk, Spock, Uhura, and the rest. There is a cutaway view of part of the Enterprise and a map of the Trianguli area, both in full color. Brief descriptions of ten alien worlds in the area are helpful and nicely done, but a bit misleading. For example, it appears Malakiyy 12/789 Circini is a single world, but a scan of the area reveals nine planets and half-dozen moons. A good rule of thumb is to scan, explore, and evaluate; don't assume the computer records are complete or accurate.

While the information booklet is fun to read, the "tip" sheet that accompanies the computer diskette is the rules guideline most directly applicable to playing the game. It gives a partial list of the most common commands you can

(continued on page 165)

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2E6

John Barnes

"Build a better mousetrap
and the world will beat a path to your door. . . ."
Oh, yeah?

William R. Warren, Jr

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There was a regrettably large number of witnesses.

Fortunately it was early morning and most of the Scouts were just starting to climb the Tooth of Time; an hour later and things might have been different. Still, there were a lot of soiled pairs of green shorts when the 767 came zooming in. When it hit the summit, it put a minor cavity in the top of the Tooth and scattered one pilot, one copilot, three tour guides, and forty-seven of the Sisters of Negligible Incontinence all over the Sangre de Cristos, several of them thudding to earth like impossible shot-down penguins on the main base of Philmont Scout Ranch.

By noon, everybody in North America had heard most of the possible variants on black and white and red all over.

The pencil was poised above the desk pad; there was a term out of sequence in the third predicate transformer, that was what the matter was, probably a mistake he'd made copying it from —goddamit the phone was ringing, drop the sucker in the wastebasket, he could hear a little voice going "Hello, hello, hello . . ." but that was better than the bell in his ear. Where was that out-of-order spot, now?

Suddenly he realized he was on the wrong road. Rip off the sheet, scribble down a short form, save you twenty bytes per iteration, might as well answer the phone now.

"Hello?"

But of course nobody was there. He put the phone back on the desk and hung it up. Henry Watts thought about that for a moment; he hoped it wasn't Peggy or Randy looking for him, because they'd probably understand but they'd still have to give him hell for it. After all, he was on company time, he should be answering the company phone.

He pushed back from his desk and scratched his stomach a little; the running had taken off that little paunch that had been growing all winter. The cubicle walls hung with all kinds of notes and reminders, meetings to avoid and directions to ignore, plus the usual travel posters the company was always giving out.

There was also a calendar, with a Monday ten days away circled in red.

Suddenly he realized that there was more you could do with that short form. If you created a command to apply the command iteratively until—until something happened, then you'd have something useful. It would eventually get to the right answer, all right, but how would the program know when it got there? What you needed was a test to stop the iterations; things would be different and stable after the critical point, but infinite repetition of that final value wouldn't do; there was potential there for a finite series with strings of a thousand or more non-identical reps.

"Hey, Hank."

"Yeah." He didn't look up; it was Gornick, and the last thing he wanted to do was take a coffee break.

"Y'wanna go for coffee?"

"I got something here."

"It'll keep."

"I want to get it documented while it's fresh. See you in a few minutes down there, okay?"

"Sure. How 'bout the Stallions last night?"

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Gornick wasn't really the only person in the world to bet on the USFL; logically there had to be someone else. Surrendering, Henry looked up. "They're Birmingham, right?"

"Jeez, you're hopeless."

He looked at Gornick closely for a moment. The man dressed beautifully, you had to give him that: of course there were seventy more pounds to dress than there should have been. "Guess so. You're talking about football, right?"

"Yeah," Gornick said in disgust. "I'm talking about football." He took out a cigarette and tapped it against the cubicle wall; as always, Henry felt an urge to go over and wipe the spot where the fat, tanned fingers and the crumpled cigarette had touched his territory.

Gornick lit up, which meant that even if he were ignored he would stand there till he finished smoking, humming to himself and thumping on the cubicle wall. "So, anyway, what did the Stallions do?" Henry asked.

"Stomped the damn Panthers. That's Michigan. I won some on it."

"That's good. I'll be with you for coffee in a couple minutes."

"I'll wait."

Henry shrugged and turned back to his desk pad. He didn't really figure on being able to concentrate between the smoke, the humming, and the thumping, but maybe an idea would come to him if he stared at this thing long enough. Carefully, he circled the expression with yellow Hi-Liter and drew in some brackets and parentheses to get the grouping and order of execution clear in his own mind. If nothing else, he had this to show for today —though it was already past three o'clock, and he'd have had a hard time saying just what you could do with it.

He started to draw a little mini-flowchart, just a box for the transform expression, an arrow down to a diamond (D for Diamond for Decision for Distribute-Define-or-Delimit, he recited to himself), arrows out of the left and right diamond tips, left arrow labeled "NO" and drawn back up to the box, right arrow labeled "YES" and drawn downward. After some thought he drew another arrow down to the top box. What he had was a picture of any iterative operation, like you could find in any textbook, and it was all bullshit unless he came up with a test expression but it looked like work and it kept Gornick at bay.

A shadow moved across the page. "I never really *could* follow all that formal logic stuff . . ."

It was really just the sudden closeness of the cigarette that made Henry jerk back at first, but he found himself looking straight into Gornick's eyes as he said, "But I got the original for this from one of your papers . . ."

Gornick abruptly looked at the calendar. "You got a quarterly, week from Monday?"

"Yeah."

"Might be able to help you. See you in the breakroom."

And with that he was gone; Henry heard him stop two cubes down to talk with one of the new guys, just a quick racist joke and on his way down for coffee. Well, Gornick never spent less than forty-five minutes on a coffee break; there'd be some quiet to work in now. And the cigarette smell would go away in a few minutes.

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The problem, of course, was what to put in the diamond. Right now the diagram said, "Do the transform, then do it again if the decision is NO, or do the next step if it's YES. Repeat till you get a YES." If he could figure out an expression that would be true when a genuinely stable result was reached and false until it was . . .

The phone rang. Wistfully, he stared at the page. He had thought that he felt an idea coming, but it was gone now. The phone rang again. He picked up the receiver.

"Hello, is this Mr. Henry Watts?"

"Yes."

"Henry, this is Delira in Financial Analysis. I'm the United Way chairperson for the division this year, and I was reviewing the records and found that you're giving more than your Fair Share."

"Yeah, I rounded up to make it an even amount. Is that a problem?"

"Oh, no, no, not at all. We'd like to use your picture in *Tailor-Tour Today* next month. Is it okay for us to use your badge photo from the file, or should we make an appointment for you?"

"The badge picture is fine."

"Okay, I'll type up the authorization and send it out in the afternoon company mail. Just sign it and send it back."

"Sure."

"And thank you very much, Herbie. It's only through the efforts of people like yourself that the United Way can continue to be the focus of so much effort. Thank you."

He was going to say, "It's Henry" but there wasn't time before she hung up. For a moment he wondered if maybe he should have had the picture taken—he didn't really look much like his ID badge anymore since he'd grown the mustache.

That brought him back to what he was doing, and he looked down. The diamond wasn't filled in, so he wrote in the test expression and got up to go for coffee. He needed to get away from this, anyway.

What test expression?

For one scary moment he thought he'd dumped out gibberish; then he saw the relation, dimly anyway. Carefully he copied it into the upper right hand corner of the desk pad and wrote down "Need proofs: $\rightarrow 0$ if value true stable, converges as i increases, finiteness thm.?" That would get him going when he got back, anyway.

Gornick was sitting at his usual table in the breakroom, holding court with two of the female maintenance people. Henry went and got his coffee first, hoping Gornick would be getting somewhere with Shelly or Phoebe and would wave him off. It would be good to sit down and just stare out the window.

As he was stirring the white powdered cream in, he heard the two of them clattering off. Well, sometimes a few minutes of conversation satisfied Gornick.

"So the Stallions won, then?"

"Yeah." Gornick looked up and smiled. "Listen, I'd like to twist your ear for a favor."

"Oh? What do you need?"

"Don't mention you got that out of my paper. I don't understand that stuff well enought to be called in on it or anything."

"Sure, I know you forget after a while."

"I don't mean that." Gornick looked

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around; there was no one else in the room. "I never did understand any of that stuff. I just copied it out of some papers at the University library, strung it together, put in some footnotes, faked out the cost stuff."

Henry looked down at his coffee. If the guy was joking, it was pretty weird; if he wasn't, he shouldn't be talking about it.

"See," Gornick went on, "I was gonna, like, suggest it to you. I could see you were in trouble. When your quarterly turns up you've got to hand in your log, right? And you were telling me you hadn't gotten a thing the other day—"

"I've got an idea right now."

"Y'wanna get your merit raise, don't'ya?"

Henry shrugged. "I can live without it. I'm a single guy, no big debts except the car—"

Gornick nodded, then held up a finger. "Yeah, but you heard the rumor about Bo-Peeps?"

"No, I haven't."

"Supposably Tailor-Tour's getting bought out by Bo-Peep Supermarkets. They thought they were going to fend it off but with that accident in New Mexico the liability suits are going to make us bottom-up. At least that's what Phoebe heard from Lisa. You know, Bellerieve's secretary.

"In a month, there might be new management in. I'd rather not have anything they could call a failure in my file."

Henry took a breath and let it hiss out slowly through his teeth, hoping he sounded impressed enough for Gornick. "Thanks for the tip. But I still want to chase this idea a couple of days."

"Your funeral."

"Yeah." He got up. "I owe the pad some more. Thanks for the talk, Paul." What the hell, call him by his first name for variety . . .

"You're not gonna—"

"I didn't hear anything."

"You're really a friend, Hank. Have yourself a nice weekend. You got a date tonight?"

Gornick looked him straight in the eye; it was embarrassing, so Henry gave him a nod and headed for the elevators. He thought he saw the nucleus of a proof, and his mind was already clicking along toward it.

"Want to see the world with your friends?

"Tailor-Tour!"

Shuckity boomp boomp boomp and a thousand violins. "What's the word? Tailor-Tour!

"Why's the word? Because at Tailor-Tour we've got the computer system that puts together your group's budget and preferences to calculate the optimum possible charter trip! You and your group *can't* be more satisfied than you'll be at Tailor-Tour!

"Call us today! You and your best friends can be dropping into places you never dreamed of before!

"Tailor-Tour! The cheapest way for a lot of people to go a lot of places all at once!"

At one little FM station someplace out in the cornfields they played that just before the news broke that the mysterious "extra nun" had turned out to be an overeager Catholic Scout from

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Athens, Georgia, reduced to two thighbones, several teeth, and a charred rosary. It takes time to pull a commercial.

The time report sheet was in his inbox; he'd forgotten to sign it. Under that there were two pieces of publicity office stuff, which he threw away without reading, and a notice about the departmental picnic, which he left in the box. He turned back to the pad.

The proof just zipped out. Now that he looked at it, it was trivial and obvious—even finiteness worked out. "Now," he said softly to himself, "what do I do with you?"

"What, Henry?"

"Sorry, Sandy. Talking to myself."

"Just don't get into a fight and expect me to referee."

"Yeah. Sorry." He got back to it. What did the resolved form have going for it? More elegant, sure, and that might make it easier to machine-prove correctness.

No.

It was as simple as that. The resolved form could always be proven, or disproven, in nine simple steps. Furthermore, if you embedded a block of code into the right framework and then resolved it, proof of the resolved form was fully equivalent to proof of the block. So if the resolution worked out economic, what you had here was a universal proof algorithm . . . *Now*, he thought, careful not to speak aloud, *if that's what it is, how do I explain it to Peggy?*

Well, never mind. To resolve it that test term would have to reach zero in a reasonable number of iterations; under a billion, anyway, per forty thousand lines of source, would be good. You could run it overnight in batch, then, come back and have the equivalent of two months of testing done the next morning. If it was much over a billion, though, he'd have a hard time selling it upstairs—no matter how good it was, it was bound to be a pig for space, so it would have to get off the system before the whole load of East Coast terminals came up, which was 6:30 local.

Well, there were some reasonable assumptions he could make, and he didn't think his guesses at the other numbers would be too far off. It took him a little while to set up a program on his HP but he worked carefully. When it was in, and right, he slowly, methodically punched in his worst-case numbers, pushing each key with a quick, hard thrust to make sure there were no mistakes.

He hit execute. The LED flickered for one second, two seconds, three . . .

2E6.

He stared at it, recalled the steps of the program and checked them, reloaded the memory with the same numbers, less carefully this time, one . . . two . . . three. *2E6.*

2×10^6: Two followed by six zeros—two million. Only two million!

"Jesus Christ." He said it softly, not wanting to disturb Sandy. "Either I'm crazy or I just invented the wheel."

He grabbed his log, flipping to the last page he'd written on. The clock said 4:08; he noted down "6/22 16:08 Potential for exploitation: general theorem with lemmas." He glanced at the long row of "17:00 No significant results today" above; then he began copying his theorem in. It was tempting to label

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it "THE WATTS CORRECTNESS THEOREM," but of course it wasn't his—the company had paid for it.

A couple of stray ideas occurred to him as he copied, more elegant and subtle ways to do things that had gone slowly and awkwardly the first time, and he incorporated them. He reached the end and wrote the biggest "QED" he dared, spilling across five of the prenumbered lines and adding an exclamation point. If anyone wanted to bitch about how he kept his log, let *them* get a result like this one.

He added a short note about preliminary estimates showing very rapid convergence that suggested exploitation was economically feasible, then sat back to review it in the few minutes before quitting time.

After a while he had another full page of notes on his steno pad.

"Hey, Henry, how's it going?"

"'S'okay I guess. You want to look at this?"

Sandy took the log from him. "Phew, you had some bad days lately, didn't you?" She sat down in the uncomfortable little wire and plastic "guest chair," squirming a bit as she started to follow the lines with her finger.

She pursed her lips, frowning at the page. It didn't help her looks any, Henry thought, feeling guilty because he liked her and it wasn't her fault that she had bad acne scars and was kind of fat. In fact, her hair was nice, he added, to himself, deliberately, and of course with the weight she was bound to have big breasts.

Honkers, he corrected himself. That's what everyone at the racquetball club called them. If you said breasts it sounded like you were sucking up to those ERA women.

Her face relaxed and her finger flew along the page; she slowed once, again, frowning a little bit, but then raced down to the outsized "QED!"

"Damn, Henry."

"Does it make sense? Did I do something circular?"

"It makes sense. And there's no circularity that I can see. I don't understand what you plan to do with it, but the math itself is pure music. This is really beautiful!"

"Thanks." What else could you say?

She gave him a shy little grin. "Would you like to talk about it over dinner?"

Sometimes afterwards he thought that he had just felt guilty for what he had been thinking while she had been struggling with his theorem, sometimes that he had wanted to celebrate it with someone who understood. Whatever the reason, it turned out that they both loved Pakistani food, and before he quite knew what was going on they were headed out into the parking lot arguing about which chutney should go with the curried lamb. "I just can't take the sweet/sour," he said. "If that's the only kind you can take, maybe we should just give up the *ghosht*."

She gave him a dirty look; he admitted that he liked all kinds of chutney. "Okay, what's your favorite place?" he finally asked. "Let's get this thing organized."

"Ayub's, out on Twenty-Sixth."

"Mine, too. I'm surprised I haven't seen you there."

"Do you eat in the back room or out front?"

"The back room, that's uh . . ." he

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thought for a moment. Ayub had mentioned that once, but he'd been there with—Daphne, that was right, and she didn't want to sit on the floor, probably couldn't in what she was wearing.

"A room in the back," she said, helpfully. "That's the side away from the street."

He gave her a sour look. "That's where they serve Pakistani style?"

"Yep."

"I'd like to try it. I just haven't yet."

His BMW was slightly more respectable than her Mazda, they decided, so she drove to her complex while he followed. She handled that little car pretty well, he noticed; it just needed some rust and dent work. Maybe he'd offer if he wasn't doing anything Saturday.

"Shit," he said aloud. "I'm falling for Sandy O'Hara. Am I out of my mind or what?" The stereo continued to pour out Led Zeppelin; he shrugged. They'd been buddies a long time—he'd just never seen her outside of work, except at the parties, of course, but she was in the crowd he ate lunch with, and, to be honest, he'd always liked her.

The buildings in her complex were named after wines. She pulled up to her apartment—227 Muscatel, he noted—and got out of her car. He sat waiting and watching her. She opened her apartment door, tossed her briefcase over the poodle, and gave him a pat before closing the door. She came around and got into the BMW.

"You want anything to drink with dinner?" he asked.

Ayub didn't have a liquor license—his mother was still a pretty strict Muslim, he would explain to anyone who listened—but you were welcome to bring whatever you wanted to drink. "How do you like your food seasoned?" she asked.

"Hot."

"Same here. Get what, an 8-pack?"

"Yeah. Pints, I think."

Most of the evening blurred together; for some reason he was a little tense, so he drank the first can before even the fried lentil wafers got there. She matched him. They both liked John Prine, the Canadiens, and Fred Saberhagen; they both despised Motley Crue, the Islanders, and Jerry Pournelle. And they both agreed that all that was very funny.

There was still a little bit of late summer sunset left when they got back to her place. "I guess this is where I invite you in for a drink," she said.

"If you're tired—"

"No, I just didn't know if you'd want to."

"Ask me."

"You want to come in for a drink and maybe to make a pass at me?"

He was glad that it had gotten too dim for her to see him flush. "Let's start with the drink," he said, taking her hand as they walked to the door. He was just being nice, he thought.

Later, as they were kissing on the couch, he let his hand drift down from her shoulder onto her breast. He thought of the old joke: "A fat girl is like a moped. They're fun to ride but you hope your friends won't see you."

She pulled away and smiled; somehow he was acutely aware of not being bothered by her pitted cheeks and forehead. "It's been a while since I was a teenager," she said. "Why don't we be honest about what we're doing and get

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our clothes out of the way?'' She brought her hands in to undo her blouse.

''Let me.'' His hand was already on the first button. He felt a little twinge of guilt over what he'd been thinking before; he wanted her to know how pretty she was, but he couldn't think of anything to say. She undid her bra; he kissed each nipple, once, gently. ''I really want to make love with you.''

''That's good,'' she said, ''because I'm out of zucchini.''

It took them several minutes to get any dignity at all back after the pillow fight, especially after Von Neumann the poodle got into it; Henry was still laughing a little as he undressed.

''Okay,'' she said, ''Now let's hear about that big discovery.'' They were sitting over coffee in the Croissant House the next morning, mostly just smiling at each other or talking about nothing.

''You saw the math.''

''Yeah. Beautiful, like I said. Now what's it do?''

''Well, you remember those brackets in the long form? The ones where I had the dummy expression in there? It turns out that if you've got correctness plus termination for the long form including whatever's in the brackets, it'll hold for what's in the brackets. You can slap a whole program in there if you like.''

''And that's what the reduced form was, then, right? Prove the reduced form and you prove the long form, which proves whatever's in the brackets. Henry, that's amazing! You could practically wipe out testing with that thing.''

''Unh-hunh.'' He tried not to sound smug.

''Wait a minute,'' she said. ''The proof for the reduced form is so cut and dried the machine can do it—but what about getting it down to the reduced form? How many iterations?''

''Two million, max.''

''Two billion's not bad. They could do most of the shorter programs with this—''

''Two million. With an em.''

She gaped at him. ''That can't be right.''

''Got a calculator in your purse?'' He gave her the numbers and the expressions, amazed that they seemed like something he'd known all his life. She pored over the napkin, working slowly and carefully, frowning in concentration.

It was that long thick chestnut hair that really made her pretty, he decided as he watched her scribble.

''Well, holy shit,'' she said finally. ''You're right. Listen, Henry old buddy, if they give you a trip to Tahiti for this and it's for two—''

She was teasing, but there was something there that made him feel distant from her. ''Really, it was more like winning a sweepstakes than anything else. I had no idea this would come jumping out.''

Sandy shook her head. ''I hope some of that luck rubs off on me.''

''Well, we gave it a good chance to.''

She stuck her tongue out at him, then looked back down at the sheet. ''What are those numbers they always quote? Two hundred trial runs before a normal program works at all, four thousand runs before you can go prod, and then about

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a year before the remaining bugs are out?''

''Yeah. The one that fascinates me is that supposedly debugging and maintenance is ninety per cent of programmer time in most shops. This won't eliminate that—''

''But if it cut it by even ten per cent—and it'll be more—wow.''

''Yeah, wow,'' he agreed. ''Several billion dollars saved across the whole country.''

She took a slow sip of her coffee, making a face because it was cold. ''Or several thousand jobs gone. Depends on how you look at it, I guess. Have you shown this to Peggy yet?''

''Nope. Just got it done yesterday afternoon. I was going to write up the report for her first thing Monday, or maybe go in this weekend and do it.''

''I need to do some weekend work myself,'' she said.

This, he realized, was a test. ''Let's go in together and then do something tonight,'' he said, not even surprised to find himself passing it.

''They're getting tired, boss,'' Mohammed said. Creighton was reminded for the umpteenth time that this kid spoke better English than he did. ''It's been almost twenty miles already today, and most of them are over sixty.''

Creighton looked at his watch. The sun would be setting in an hour or so. Despite the early start, they had five more miles to go.

''It says here on the itinerary, walk this way, this far,'' he said. ''They're gonna be even more upset if they don't get what that silly computer promised them.'' Behind them, the ragged column of mostly fat, mostly old people gallantly wheezed along. Some of the old gaffers had gotten their second winds now that the sun was lower in the sky and a sea breeze had sprung up.

Reverend Shinplaster had come up to join them. ''To think the Master did this in his bare feet,'' he said.

Creighton almost tripped over a rock in the road; his toe stung. He had an abrupt inspiration. ''Um—Reverend—I guess people are getting tired. Maybe we want to modify this little plan here, stop somewhere early today and not go so far tomorrow. Exactly what was it that you promised them?''

''Well, the same thing I asked Tailor-Tour to set up,'' Shinplaster said, mopping his forehead. ''I said, five day tour, walk where Jesus walked. I'll go back and see what their feeling is about changes in the tour to make the pace a bit easier. Naturally, if there are changes I'll expect some rebate for the congregation.''

Creighton nodded, grimly trying to imagine getting that out of the home office back in Texas. The old preacher headed back to his flock.

''You know,'' Creighton said to Mohammed, ''I would bet that silly system is trying to have us walk *everywhere* that Jesus did, in exactly five days.''

Mohammed nodded. ''We had a program act up that way back when I was at Southern Cal. If you don't specify a subset, some compilers assume the set or even the superset.''

Creighton wished he knew what this kid was talking about.

It was past one Monday before Peggy called him in. When he got to her office

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she was on the phone. After a while she hung up and turned back to him.

"You sure know how to have a good quarterly, Henry," she said. "That was Delira—you know her, don't you?—and she was telling me that besides having a hundred per cent pledge rate here we've got you actually putting in more than your Fair Share. You've really helped to make us the best team in the best branch in the pack. Sorry, I mean the company—I'm den parenting this year and a lot of my outside emotional investment goes to that commitment."

He nodded. "Have you looked at that report I gave you this morning?"

"Some way to reduce the number of tests you have to run?"

"You could call it that—"

"I've kicked it up to Randy. He always wants to see anything in that line he can get—looks good for upper management. And of course—this is under your hat—the way things are going with this accident we all need to look real good. So it's really a positive thing that you came up with this when you did if it turns out to be anything. And with this United Way thing the team as a whole will look good too. I just really want to say I admire your commitment—"

He nodded, feeling oddly tense somehow.

"Is that all we have to go over?" she asked.

"Yeah, I guess so."

As he went back to his desk he felt a strange urge to just go down and drink coffee for the rest of the afternoon, but he pulled out the pad and sat down to work some more on the idea.

One thing that might be interesting, he decided, was to do a little space optimizing—new systems were always such pigs—

"Hey, Hotshot."

Gornick again, of course. "Hi. What's up?"

"Was gonna ask you. You're doing pretty good, I hear."

"Didn't think they'd looked anything over yet—"

"You kidding? Randy's secretary—you know, Gwynnie, the new one, red hair—she says he got all excited about some report you sent in. And there's this United Way thing, too. That never hurts. You're hot this month. You want to go for coffee?"

"Yeah, I guess so."

They were sitting down in the breakroom before the conversation went any further.

"Things sure are different," Gornick said.

"What things?"

"Well, you know. The way the shop works. Jobs. Like when I got into this field I came in out of accounting. I learned to write a little COBOL, spent a while mounting tapes, stuff like that. Most of you younger guys have never even seen the CPU itself."

"You're right. I just talk to him; I've never met him."

"You probably always used a terminal, too—never had to worry about a spilled card deck."

"Right again."

"See, when I got in, if you got anything to run at all you could make as much as a half-ass lawyer. It was different." He lit a cigarette, and went back to humming and thumping on the table. Henry sat and tried to visualize

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the optimization as a surface in—what? —six-space? He wasn't that much of a mathematician.

"Nowadays you guys talk all the time about this math stuff, set theory and all that. I never really even needed the calculus I took in college. I used to be a hotshot just with JCL."

"*You're still the guy we come to—*"

"Yeah. But you could go to the manual." He sighed. "They got systems that'll generate everything I do already. The company just hasn't bought them yet. I just hope I can keep doing something till retirement. I'm already doing this damn bullshit stuff on research, and I don't know how long that's gonna hold."

Henry nodded slowly. "So far your name hasn't come up. In the thing I did, I mean."

"Thanks, kid."

"How'd you wind up in R&D, anyway?"

"Crazy, isn't it? I wanted out of my old shop and got stupid—quit before I had another job. Where I was, I was doing user interfacing—sit down with some engineer or accountant and ask him what he wants. It used to be we'd tell them. I was getting these real low performance ratings, so I decided I'd get a lot more of a break in a new shop, and I thought that with all my background it wouldn't be hard to get a new slot—didn't realize how locked into the old company's procedures I'd gotten. Only way I got hired here was that it came through Personnel—to most of *those* people, experience is experience. So it was this job or none, and I had car payments and my boy's orthodontist to cope with, so I took the job." He lit a fresh cigarette off the old one, which he left to smolder in the ashtray.

"I tried to read that shit. I really did. It didn't work . . . I was just outta my depth. Maybe I can go somewhere to do maintenance COBOL if something opens up. Or Bo-Peeps might sweep on in."

"*That looks likely?*"

"Yeah. You hear about how the New Mexico accident happened?"

Henry shook his head.

"The program was supposed to optimize some low-flight sight-seeing. It worked with average ground height to get altitude; it was supposed to come up with optimal non-collision flight plans to swing around certain points. For some reason all those nuns wanted to look at mountains. The Tooth of Time was on the list, so—"

"Shit!"

"Yeah. It had this point to get close to, and it was figuring average heights, and the Tooth of Time sticks up a lot more than the country around it. So it flew at the calculated height, right through the point."

"Did one of *our* people make the mistake?"

"Some engineer did the algorithm. They fired him fast—this morning in fact."

The conversation died out after that; Henry went back up to his desk. When he got there, Sandy slipped out of her cube and came over to him. "Randy wants to see you. He seems to be in kind of a hurry but I don't think he's mad at you."

"Thanks," Henry said, glancing around at his desk. "SEE ME RIGHT NOW IMPORTANT" was scrawled

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across his morning's work; "Randy" ran off the page and onto the desk pad. He gave Sandy a furtive peck on the cheek and went off to Randy's office.

"Howdy, Hank, come right in," Randy said, awkwardly rushing around the desk and closing the door behind Henry. "Just finished that report of yours and by-Sweet-Mary's-Holy-Nipples I think it's a good'un." He made a noise like a tubercular seal and bared his teeth; after a moment Henry realized that that was a laugh and a smile.

The big man dropped back into his chair and flashed his teeth again. "It's not every day I get excited. But I am *so* high on this—tell you why, okay, Hank? Little company politics.

"This crash thing has everyone worried. No way now we're covered against that takeover bid by Bo-Peep—oh, I know that you know, word gets around. Anyway, what we need right now for the company—and the department—is something good, something new, to take the taste out of our mouth if you know what I mean. And this thing of yours looks just great for that, I mean just great, Hank."

"Thank you," Henry said.

"See, to tell you the truth, what happened was Mr. Bellerieve, he got on this kick about the whole thing. I mean, he founded this company and all and it's like his baby, he's got to rock it. So he got the board and all the managers, even down to junior ones like me, and he brings us all together over Sunday afternoon for a real come-to-Jesus meeting, lays out what we gotta do. And I was sweating because to tell the truth we didn't really have anything here in R&D to contribute right off the bat—and then I picked up your report, right here on my desk, this morning. I was thinking about running right out and giving you some strokes on that, but then I got all these calls about the secretarial workshop we're sending Gwynnie and Jan and Cher to and that kind of ate up my morning. It's a good workshop and I'm glad we're sending them to it but it really did kind of eat into my time—of course eventually we'll save more time as their efficiency goes up. Anyway, there's the report on my desk, and if I look at this right we could debug every system we got here in a matter of a few weeks, am I right? Or like maybe we could redo the whole system in a half year or so, then market it as a collateral product, get some fast cash flowing into that kitty, you see what I mean? I'm just throwing out a bunch of balls, let'em bounce around, you just grab one, that's what I want you to do."

"Well." Henry thought. "I think there's a lot of potential in the idea. And most of it we can mine pretty fast."

"Yeah, exactly, that's what I like about this—we're not getting into anything too deep. The idea would be to go full prod ASAP, have something leak out and hit the finance pages inside a week or so and get the stock back out of Bo-Peep's reach. Okay, see if you like this one, if you don't we'll just hang up another one and you can shoot some holes in it too. We're supposed to have another big meeting tomorrow, like about seven in the morning because Bellerieve's an old-farm-boy early riser. You and me get together over some dinner, say at that French dip place down the road, start seeing what we can do, hammer this into a proposal, stay up the

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night if we got to, then come right in with the dogs and ponies tomorrow. Can you see it go?''

''Well—''

''Terrific. Do some prep on it, meet me here at 5. What we need to know I guess is how long to get this up and running—write the source and prove it out and all—and then some pilot projects—just some time figures.''

''Sure.'' Henry suddenly felt confident; if they made him the kernel of a project team this week, they certainly couldn't gun him down on his quarterly a week from now. ''Let's do it.''

The big man nodded. ''I think we made some decisions here, covered some substance. How do you feel about it?''

Henry nodded back; an image flashed through his mind of the two porcelain beagles, heads bobbing away in the back of his mother's old Rambler when he was a kid.

Randy flashed the teeth again for an unprecedented third time. ''Okay. Then I'll have Gwynnie call Lisa and get us on the agenda for tomorrow A.M. I think that's all I need from you. Did you get everything you needed from me?''

''Yeah. I'll come here at five.''

''That's good. Oh—yeah. One thing. They're gonna want a capsule description of this thing for the meeting. Can you tell me real quick what it's all about?''

Twenty more minutes of walking, with the temperature falling off and a breeze coming up, and Creighton began to feel a little better. Anyone who did tour guiding in the Mideast had seen worse than this, after all. And there had been no heart attacks or strokes—thank Whoever, Shinplaster's sect were strict vegetarians, nonsmokers, and nondrinkers. Not as much fun as Methodists or Presbyterians, but they held up better under the physical stress.

Mohammed caught his elbow. ''How long did it take Jesus?''

''Three years, but he stopped and backtracked a lot.''

They came up a rise; the two guides slowed down to let the column get together. ''Salim's still bringing up the rear pretty well,'' Mohammed noted. ''And they all seem to be together. It's going to be late when we get in, though.''

''Yeah. That breeze smells good. I guess I'd rather walk this in the evening, anyway.'' He sighed. ''Tomorrow, we'll call the home office and have them refigure the itinerary. Anyway, we're only a little way now from a bed and supper, and the map shows it mostly downhill and in a straight line.''

They topped the rise. Below them, the road ran down to a little village, probably not much different from the ones Christ had stopped in except for the Coca-Cola sign and the TV antennae. At the edge of the village there was a row of boats; beyond the boats there was water stretching to the horizon.

For the first time in six years of showing church groups around, Creighton found himself praying as he stared at the water. Four our-father's and five now-I-lay-me's later, when the rest of the group had caught up, he had acquired the composure to turn to Mohammed and say, ''That wouldn't be the Sea of Galilee, would it?''

* * *

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"I've got an exciting date with Randy for tonight," Henry said, and explained what had happened. "I'm sorry about not being able to come over for dinner."

Sandy shrugged. "The only thing you can say for my cooking is that Von Neumann and I are still here. Besides, how often does anything this big turn up in this shop?"

"Yeah. Well, I have a bunch of stuff I usually do—park league softball on Tuesday, Hacker's Club Wednesday, and racquetball Thursday. I could cancel out of something—"

"Why don't I just come to your softball game?"

"Well, people usually go out afterwards for beer and pizza. You like that?"

"I even like it for breakfast. If it's okay to invite myself."

He looked at all that soft hair falling around her face and grinned. "If they don't like it, they can get somebody else to warm the bench for them. Tomorrow I can go home as soon as the meeting's over; I'll catch a nap and then be by to pick you up, say six-thirty?"

"Great."

She kissed him, discreetly since it wasn't quite past five. "Bye."

"Bye-bye."

He turned back to his desk, knocking the papers he would need together. There was a tap on the cubicle wall.

"Lucky bastard," Gornick said. "I hear you're going to save all our jobs, too."

"Supposedly in just one night."

"It sure has all come together for you, hasn't it?"

Henry nodded, realizing it had.

"Good," Gornick said. "She's a nice lady; you're brilliant. When's the wedding?"

Henry forced a laugh. The older man gave him a wave. "I won't keep you. Go to it, whiz-kid."

"I'll go with you, as far as the elevators. I'm spending the night with Randy."

"I bet that's the prize for being good. Second prize is two nights with Randy, right?"

Well, that wasn't bad for Gornick, Henry thought. They said goodnight and Henry went off to join his boss.

"It's not that bad, Ted, we can straighten it out and hush it up. Creighton did the right thing with the old geezers—most of 'em thought sitting out with the flocks that night was wonderful. Shinplaster's the only one bent out of shape. Now what the hell happened with our other Holy Land group?"

"We think we've found them. The data on the backup tape shows they left early."

"Do they want a refund?"

"No—in fact the phone log shows they keep calling to tell us how happy they are. I don't know why they haven't called their relatives. But their tour guide's in jail. Drug charge. I don't know what all about that yet, but the Israelis are pretty tough on that kind of thing."

"I think we got the groundwork laid pretty well at the Meat'n'Wheat last night," Randy said, as they pulled out of the I-Hop parking lot. He patted the folder on the seat beside him. "This is something, Hank."

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"I hope so. I don't think I can eat any more."

"Know what you mean. Well, it's six thirty and we've been through it twice, right?"

"Right."

"Pretty good, I'd call it. You really picked up that ball. Guess we both did."

"Yeah."

Three hours later, they were still sitting outside the room, along with all the middle and lower management. Nearly everybody was asleep; the nearest cube had a big pile of jackets and vests. Henry was surprised that *he* was the first one to wake up; maybe all that caffeine overnight, or maybe just excitement, had kept him from sleeping longer. He got up carefully, not letting Randy's head slam against the wall, and got a drink of water, getting some of the hairy feeling out of his mouth.

In the men's room mirror he looked pretty awful; but rinsing his face, combing his hair, and redoing his tie made him feel considerably better. He might live, after all, he decided.

There was something a little strange about the long row of men in business clothes sleeping all over each other in the hall; it looked like the pictures in the papers of bums on the sidewalk. Henry got his jacket back on, found a couple of stray pieces of paper in the pockets, and sat down in the empty cube to doodle a little bit.

An elegant algorithm doesn't necessarily become an efficient program, but an ugly one never does. There were still some rough and awkward spots in there—steps four and eight seemed to be two aspects of the same thing; ideally you wanted to combine them. He had filled both sheets and had started on the back of an old pay envelope, without really getting anywhere, when the board and the veeps started coming out.

The long line of sleepers struggled to its feet like a dizzy caterpillar, the managers jostling against each other, faces slack and twitching, trying to look alert. Henry quietly handed Randy his jacket; Randy shrugged it on, a little bleary but looking better than most of the other, older managers.

"We're going to take about ten minutes and then come back," Bellerieve said. "Y'all can go on in."

Henry got Randy into a chair and hung his own jacket over the one next to it. "Need some coffee?" he asked.

Randy nodded; Henry went down to the breakroom. It was still a while before the regular coffee break crowd would be down there; he was surprised to hear the amount of talking and laughing going on, but then he realized that it was the board and upper management.

As he opened the door, it seemed to hit him in the face. They were all happy and laughing, relieved somehow. They must have pulled something out to fight off Bo-Peep with.

He moved quietly through the crowd of them, being as unobtrusive as he could manage, and got the coffee for himself and Randy. It seemed to him that people got very quiet wherever he was, and that Bellerieve looked a little strained, but he put that down to his own nerves and lack of sleep.

It really took them more like half an hour to file back in; old Burroughs from Customer Relations was almost asleep again by the time things got going.

Naturally enough, every other de-

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partment manager had been up all night, too, working on coming up with a miracle. There were proposals for company uniforms, new ad campaigns, revising the accounting system, new insurance plans . . .

By the time it was their turn, Randy seemed to be a little muzzy again, but he pulled together and stood up. "Gentlemen, I'll be brief. We've had a major breakthrough here, maybe as big as databasing was in its time. The man responsible is Hank Watts here; he'll explain exactly what it is, and then I'll go into what we can do with it."

Henry had really been expecting a longer lead-in. It took him a moment to realize he was supposed to talk.

As he went through it, he noticed that nobody seemed to be paying attention except Randy. That didn't surprise him—after all, this was pretty esoteric stuff, and since all Randy wanted was a summary of conclusions, the proofs themselves weren't there. Probably it was like listening to a math lecture. It was beginning to seem dull to Henry.

He sat down and Randy got up. "The implication of all this," he began, "is the possibility of the totally correct program in an economical amount of time. If we'd had this a year ago, none of the recent regrettable incidents would have occurred. More than that, this *guarantees* correctness. No more testing, no more rechecks—"

He went on like that for a while, talking about the cost of error correction and how much cheaper this would be—at least according to the carefully cooked numbers he and Henry had come up with at four that morning. Most of the board was looking at its watches; one vice-president got up and clambered over three sets of legs to get out the door.

Finally, Randy wound down to his last point. "And, not least, of course, once we've proven this in-house there's considerable potential for licensing."

Suddenly he had the attention of the room.

"In your opinion, this is licensable? If it had been available, say, two years ago before we put on the purchasing freeze, would you have bought it?"

Randy nodded. "I think anyone would have. The costs of error correction are so high in most shops—"

"I think," Bellerieve said, "that this is something that we should go ahead with, as quickly as possible." By now they were all nodding; quite a few were smiling. "Okay, Randy, put all the people you can onto this, full-time, ASAP. This is a priority project. I want this thing going full blast by the end of the week."

Randy sat down next to him and gave him a cautious thumbs up under the table; Henry nodded. The meeting went on through two more presentations, one on going over to leased office machinery and the other on a cross-promo with Greyhound for a senior citizen deal. By the time they adjourned it was close to noon.

"Heya, Ted, Bob again. It was mushrooms."

"What was mushrooms?"

"What that tour guide got caught with in Israel. There's good news and bad news on that, I'm afraid. The seminarians are actually forming up a committee to promote the tour."

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"Sounds like your people are on top of it, Bob—they must've had a great time."

"Uh-hunh. Get this—they're saying you're not really Christian till you've done our tour."

"Wow. If they've got any influence at all, we've got a meal ticket. Now what's the bad news? I assume that's what you called me about."

"Well, uh, Ted, the computer itinerary *told* the guide to feed'em the mushrooms."

"Hmm. What did they ask for originally?"

"Something as close to the original Christian experience as they could get."

"Uh-oh."

"Could have been worse. Remember they went home early. For the last day the bill of materials included a bunch of boards and nails."

"Okay, listen. Instruct the system to dispense with the AI subroutines."

"What's AI?"

"Artificial intelligence. Tell it no more artificial intelligence. Okay?"

"Right."

Sandy was a little drunk, and the outfit she'd worn to the game was briefer than Henry would have suggested. Still, he'd noticed a couple of his teammates had looked her over pretty thoroughly and seemed to like the way she looked; he felt good.

The pizza had disappeared a while ago. They were on the third pitcher. Every so often she was running a hand down his thigh under the table.

"God, you're a genius, Henry," she said, turning to him.

"I know."

"Seriously. You should have heard people around the office this afternoon. They've thrown all kinds of resources into this—in fact they're having me and Paul Gornick and a couple of other people drop what we're doing to work on this. Randy is so high you wouldn't believe it. You sure don't have to worry about that quarterly."

He nodded, and leaned back in complete bliss.

"They really seem to think you've saved them."

"Well, what do you think?" He smiled at her; she looked abruptly serious.

"I just don't see how they can get it on the market fast enough to make a difference."

"Randy said they probably didn't have to. Having this makes our stock more valuable as soon as word gets out. That makes the takeover more expensive. These things apparently get decided on the margins—so a little change like that should be enough to scare Bo-Peep off."

"That's good. So you saved us, hunh?"

"Guess so."

"I put extra food in Von Neumann's bowl, so she's fine. You got any energy left, if I get sidetracked and stay the night?"

"I hope so. Want to go now?"

"Yeah."

A quick backward glance told him that three of the team watched Sandy's hair and ass out the door. He looked at her under the parking lot light and concluded that they were absolutely right;

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she caught him looking and smiled, and that was even better. He told himself he had always been partial to the Rubens type anyway.

"TAILOR-TOURS! WITH 100% NATURAL, ORGANIC INTELLIGENCE!"

Fortunately somebody caught that one before it went out to the papers.

The place was infested with them. The men all wore wingtips and three-pieces; the women all wore navy suits with little ribbon ties and black Italian pumps. They asked a lot of questions. None of them seemed to like or dislike any answer, as long as you answered.

It was hard to believe that that board meeting had only been a week ago.

This one—his name was Ken—was in Henry's cube, looking through his log. "So until two weeks ago, on the average three point eight days of the week your entry is 'No significant results today' at seventeen hundred. In fact that's your modal log entry. Would you like to explain that?"

Henry nodded. "It's kind of a matter of luck. I ran down a lot of blind alleys before I found the one that would work."

Ken's expression didn't change, but he moved his head a little; there was a glint from the steel rims of his glasses. "Why did you do that? Why didn't you start on the right one?"

"I didn't know which one was right until I tried them."

"Do you plan your work, Henry?"

"About once a week. I schedule what I'm going to read and work through, budget time for meetings, stuff like that."

"These blind alleys—after you found your right answer, you didn't continue to pursue them. Why?"

"Because I had the right one."

"But you didn't do that before."

"Well, no, Ken, uh—"

"How many square feet of space would you say are in this cube?"

"It's an eight by ten."

"How many square?" Ken demanded.

"Eighty."

"Thank you."

Ken stood up and stuck his hand out. Henry got up and took it. "Did you want to know anything else about the work?"

"We'll get that from Randy."

He had two more interviews that day, with Gwen and Ben; they were so much like the first one that afterward he couldn't remember which was which. Across the street at Bitty Burger, after work, Sandy and he compared notes; with minor exceptions, the interviews had gone about the same.

"I still can't believe they did that," he said. "I don't think Bellerieve wanted to, but the vice presidents and the rest of the board rode him down."

"Well, you can't blame anyone for using the golden parachute," Sandy said. "Especially as bad as the odds were."

"I know, but somehow—"

She wiped her mouth and moved the tray aside, then reached out and took his hand. "I know, you thought you'd saved the place. That's really tough on you. But this whole thing was set up before you and Randy ever got into that

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room—and once they've got their parachutes on they don't really care about anything else."

"Well, yeah, but why did they approve the project and make it a crash thing?"

She shrugged. "I don't know, but I bet we find out."

"You never really think about how big Tailor-Tour is until you get us all in one room," Peggy said. "Any runs in my stockings?"

"You're fine," Sandy told her. "God, there are a lot of people from Bo-Peep, too."

Gornick grunted. "Hope everybody has their resumes in order."

The leader of the Acquisition Review Team was coming to the podium; at a glance from Randy they all got quiet.

"Good afternoon," he said. "My name is Len Wren. As you all know, Bo-Peep Supermarkets has recently acquired a controlling interest in Tailor-Tour. We've been here this past week to look over the property; by and large we've been pleased with what we've seen. We do think that there have been problems with a lack of dynamism, and with a certain overcommitment to change, in the organization. However, we feel we can safely assure you that most of you will be retained, subject of course to future performance.

"The biggest difference you'll notice is that we're a somewhat more modern and progressive organization, so we keep a tighter focus on that bottom line. Apparently the old management was not especially profit-oriented; they tended to regard the present quarter as an investment phase. *We don't make that mistake*. For example, your first task over in Planning, Bart, will be to start drawing up a one-year profit maximization plan."

You could almost hear Bart's shoulders falling and his hands unclenching.

"For those of you who are wondering, let me explain a little reality to you. There was a time, I suppose, when you could do this kind of slow cultivate-your-garden stuff; it wasn't very progressive or efficient but you could get away with it.

"Nowadays those corporate dollars come from investment, not retained profits. Where do you get investors from? From running a high quarterly profit rate, because that investor, bless his soul, is interested in profit rate—he's what makes the system go, rewarding the hares and punishing the tortoises. Your profit rate's gotta beat a double-digit prime rate or they're gonna get out of you and into CDs and money markets.

"We took Tailor-Tour because they forgot those realities. Nobody takes us. *Nobody*. Now, naturally we'll be adjusting things, and a few of you, mostly through no fault of your own, will be let go. Of course we won't contest an unemployment claim on that, if it happens to be you. *But* for most of you, your job is going to be more secure, not less, and the reason for that is exactly that Bo-Peep will not get taken. We keep those profits high, every quarter—and we'll sell Mama to the Arabs to make sure we do. And that means the money comes to us, and the job stays with you.

"So I want to welcome you to the Bo-Peep team. I think you're a valuable

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new rookie to us because this computerized pleasure optimization is absolutely revolutionary in the travel industry; and I think we can do a lot for you because we can show you how to quit developing and start reaping that profit harvest. We're all in this together now; no hard feelings; I'm glad you joined the team."

There was a wave of polite applause; everyone, looking at everyone else, joined in.

Wren nodded an acknowledgement. "Now, to explain the organizational new look, here's our chief senior analyst, Doctor Tsen Fen-Chen."

Dr. Tsen was a small man with a surprising big black handlebar mustache. He didn't have much of an accent. "We began by looking at our primary expenditures and primary returns. As is typical in a non-capital intensive industry, leased floorspace was the major expenditure. Now, a weighted least squares multilinear regression allows us to allocate generated profit by department. I trust that's clear.

"We find that profit generated per square foot floorspace in most of the company is about equal to that in a medium-sized grocery store with a deli and flower counter in a stable ethnic neighborhood. This is not good, but experience with prior acquisitions in the insurance and textiles industries shows that by introduction of proper time management and hiring controls we can bring it up to an acceptable level with a less than four percent reduction in personnel.

"There are two exceptions to that general situation. One is Travel Sales, which of course is primarily composed of small spaces in shopping centers. The profit per area in that sub-department is simply phenomenal, comparable almost to the liquor sections of some of our larger suburban markets during the year-end holidays. Thus, you can expect an enormous expansion of that sub-department, probably including an upgrade to full departmental status.

"The other is Research and Development."

Sandy squeezed Henry's arm.

"The earnings per unit floorspace there are perfectly terrible—every bit as bad as traditional walk-to food stores in primarily-elderly urban areas. What we do with *those*, of course, is close them. In this case, acceptable profit contribution can be obtained, I hope, with about a ninety per cent personnel reduction.

Questions?"

They made a bunch of announcements of temporary assignments next; the only one of any interest to Henry was that the whole R&D department was supposed to report to a conference room. Though they all went together, nobody talked in the hallway, or in the room once they got there. Randy scratched and looked at the wall. Peggy fidgeted now and then. The rest of them watched Randy and Peggy.

A young guy in a pinstriped suit came in and sat down. The fluorescent lights glinted off the oil on his forehead; he seemed a bit nervous. "Hi. My name is Glenn. I'm the Termination Counselor; I'm here to explain the termination program and to discuss the reasons for closing out the department. First, I'd like to give two people some good news.

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Which one of you is Mr. Paul Gornick?"

Gornick raised his hand, just barely; Glenn nodded at him. "You're being retained. In fact, we're promoting you to acting manager and sending you to management training school." He looked around at everyone. "The reason for the decision is simple. *Mr. Gornick is productive*. We don't find many of those 'no productive result' or 'no significant result' notes in *his* log. And in the past two years, he has consistently turned out papers and technical memos at a regular pace. Further, we found that he always wrote comments on every technical memo he received. His contribution, quantitatively speaking, is almost double that of his closest competitor, Ms. Sandra O'Hara. In a creative position, like R&D, it is all-important to be productive—R&D profit contribution is estimated based on R&D paper production and circulation. Thus, most of R&D's meager contribution to overall profit came from Mr. Gornick, and, to a lesser extent, from Ms. O'Hara. Ms. O'Hara will be moving into the project leader position to be vacated by Ms. Peggy Drewson."

He sighed. "Mr. Gornick and Ms. O'Hara, I'm afraid, are the only people being retained. They can return to their desks for the time being. If the rest of you will please form a line outside this room, I'd like to meet with each of you briefly, in alphabetical order."

Henry leaned back against the wall; he was last in line, of course. After a few minutes, Sandy came around. "I'll be by tonight," she said, "if you like. Want me to bring wine or do you want to hit the bars? I'm buying."

"Bring the wine." He glanced around; nobody was looking at them. "Thanks. Love you."

"You too. See you at seven."

She walked away quickly.

When he got into the room, Glenn motioned him into a chair. "Henry Watts, right? What do people call you?"

"Some people say Hank; I go by Henry."

The young guy nodded, not meeting his eyes. "To tell you the truth, the decision on you was real close. We could probably fit you into our organization, Hen. You had a lot of 'no results,' but the volume of papers—and their quality—offset that considerably.

"Oh, yeah, don't be so surprised—we look at quality. We're not idiots. We had a guy review all the papers; he said yours and Gornick's were easily the most profound. Of course, Gornick did come in a little ahead of you—the reviewer said his papers were an enigma. But all the same, your work was equally as good as Gornick's, and even at that lower volume we might have kept you.

"The thing that sunk you was thirteen eff. You know what that was?"

"I heard it mentioned." Through the shock, his curiousity was nagging him.

"You know what a golden parachute is? What the board and upper management did?"

"Yeah." To his surprise, he was angry. "Gave themselves new contracts with huge severance bonuses, so if you came in and fired them they'd be sitting pretty."

"Right. But not just severance bonuses. All kinds of potential obligations against the company for years to come. Thirteen eff says if any research was

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done on a project while they were here—and the project turns out licensable or patentable—they get a big split of our royalties. In other words, if this error detector of yours works, and is as big as it looks like market-wise, we'd be obligated to keep giving those guys money for years and years.

"We don't like the golden parachute. It costs us plenty in most acquisitions, so we try not to pay out on it. One way to avoid it is to give you the rights to your work, and turn you loose. Let us know when you've got this on the market—we'd like to buy one, like any other customer."

"So—it wasn't my work?"

"No. Or rather, yes it was—you're too damn good. Sorry we can't keep you."

He signed the papers and got himself set up for the unemployment claim; it was strange how elated he felt.

The problem with trying to switch off AI was that Bob was a businessman, not a computer jock, and he had to talk to the computer through ServiTor, which used an AI function. ServiTor was smart enough not to let people accidentally cut themselves permanently off the system; so, when ServiTor got told "no more artificial intelligence," he couldn't possibly interpret it as an order to shut down. After one full millisecond of CPU time, he found the word in the PR phrase file and borrowed some other phrases to write the new advertising copy. Since he'd succeeded in doing something with the command, he sent a message back to Bob: "Accomplished."

Ted probably would have tracked that down, but he was another head on the pike after takeover.

"I think you're a goddam marvel," Sandy said. "Especially that you're not bitter." She leaned forward to pour him another glass of wine, then cuddled back against him.

"Well, I still *have* my work; I just have to find a place that wants me to develop it. And I'm sure *somebody* will pay me a good salary to do that. Like they say, errors, testing, debugging—that's the biggest part of software cost. Not to mention all the applications where they can't afford errors—medical rapid-access record systems and CAD/CAM for two. I'm going to start cranking off resumes on my home system first thing tomorrow, and making some phone calls to people I know in other shops. I ought to be able to find something pretty quick with this under my arm, and the unemployment should get me through to the first paycheck."

"Yeah. Listen—this probably isn't fair, we've only been dating a couple of weeks, but, uh, what about us?"

Henry shrugged. "I like you a lot. Let's keep seeing each other—cheaply. You know, movies, pizza, kid stuff. I'm afraid I won't be able to afford Ayub's for a little while."

"You will if I treat you. Would you mind?"

"No. Fine with me. Just not too much, okay?"

She smiled at him. "You're forgetting. I'm rich. I got a promotion."

He had forgotten; now he asked. "If you don't mind telling me, how did they decide that?"

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Sandy tossed her hair back over her shoulder. "Weekly status memos."

"You mean those things that you—"

"Yeah. We had to do them at my last shop, so I kind of got the habit. Every Friday I'd write up the week's results, plus some stuff about how I was going to proceed next week, copy to Peggy, copy to Randy, copy to file. It was supposed to be, among other things, a way to make sure I got proper credit at review time. But since they averaged around two pages—"

It was wonderful; he started to laugh. "That gave you a hundred and four extra pages per year."

"Ninety-four, actually," she said. "There were some one page ones, and of course I get two week's vacation."

"Just be sure you show me the format. I'm going to do that on my next job." Henry squeezed her gently. "You have to get up in the morning; I don't. And you seem drunker than I do. You want to stay the night here? We can just sleep."

"I'd like to stay the night. And if you're planning on just sleeping, I hope I won't disturb you with what I'm planning."

Actually it took almost a year for Henry and Sandy to get around to getting married. The world stops for no occasion—a lot of things happened on their wedding day.

Due to a missing minus sign in a rarely-used discriminator subroutine, the Cheyenne Mountain facility briefly thought a flock of Canada geese was an incoming Backfire bomber. Two RCAF F-16s scrambled at a cost of several thousand dollars Canadian per minute; the geese did not bomb Saskatoon.

Miss Mabel Schwarzkopf of Washington Court House, Ohio, killed herself. That's not uncommon in old people; the coroner was certainly not interested in knowing that Miss Schwarzkopf had not received her Social Security check for four months.

7,213 people received incorrect credit card bills due to "computer error." 6,842 of them paid them anyway.

Two nuclear power plants, using the same piece of control software, had unexplained zoomies lasting a few seconds; in both cases the operators simply ignored them, based on long experience.

And Henry and Sandy found their reservation for a hotel room in Key West mysteriously cancelled; "the computer does that all the time," the clerk said, and found them other accommodations. Everyone at Henry's new job thought that it was very funny that this should happen to him when he told them about it later; eventually, even Henry found it funny.

After all, thanks to him, there had been no software-attributable customer complaints about "Astro-Gorgons" in the ten months that the game had been on the market. ■

● What is the use of a house if you haven't got a tolerable planet to put it on?

Henry David Thoreau

Submitted by G. Harry Stine

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The Alternate View

CHILDREN OF THE SWAN

John G. Cramer

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Deep under Mt. Blanc, the largest mountain in the Alps, is a highway tunnel connecting France with Italy. In a big side room constructed near the tunnel midpoint is a large 150 ton cube of metal plates and photomultiplier light sensors. This apparatus, which physicists have named NUSEX, was designed to observe the extremely rare proton decay, the final self-destructive act of a basic building block of the universe (discussed in my first AV column "When Proton Meets Monopole," *Analog*, July 1984). Up to now NUSEX has seen no proton decays. But it has detected something else, something coming out of the summer night sky of the northern hemisphere from the direction of the constellation Cygnus, the Swan.

In the remote deserts of Utah, at a location selected for clear air and remoteness from the lights of civilization, is the Fly's Eye, a group of "compound eye" light detectors with photomultipliers for facets. It watches the night sky for the light made by the most energetic cosmic rays as they enter the upper atmosphere. Physicists using the Fly's Eye have found an exciting new result: the upper energy limit of cosmic rays. And they have also observed something else, something entering the atmosphere from the direction of the Swan.

Beneath the rolling hills of Ohio miners have burrowed deep into subterranean salt domes seeking salt for the round blue boxes on the supermarket shelves. In one of these, the Morton Thiokol salt mine near Cleveland, physicists have placed a large tank of water watched by photomultiplier light sensors to observe proton decays and energetic neutrinos from supernovae. Proton decays have so far been absent and neutrino counts sparse, but something else has appeared in their detectors, something coming from the Swan.

A third of a mile below the surface of Minnesota in the Soudan Iron Mine another proton decay detector named Soudan-1, a stack of 3,456 ionization sensor tubes, is detecting something coming from the Swan. And similar reports are arriving from other underground detectors around the world . . .

A new branch of experimental physics has recently emerged which some call "mineshaft physics" or even "troglodyte physics." Its key element is the mounting of large (and expensive) physics experiments deep underground so that sensitive detectors can be isolated from the strong cosmic ray bombardment at the earth's surface. Typically a few thousand feet of rock serve as a radiation shield providing a low radiation environment for these super-sen-

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sitive measurements. Experiments now operating in this "troglodyte mode" are probing the stability of the proton, or counting neutrinos from our sun, or searching for super-energetic neutrinos from supernovae.

The detector responses of such experiments are called "events." These must be carefully sorted to separate the interesting "signal" events from the unwanted "background" events. But now some of the background events are beginning to look more interesting than the signal. A maxim of physics is that when you look where none have looked before you may see what none have seen before. These underground experiments indeed seem to be seeing something new and unexpected. Some of their "background" seems to be an unknown kind of extremely energetic neutral particle which has been christened the "cygnon."

The source of the cygnons has been traced to an unusual binary star system in the constellation Cygnus. In recent years space-borne instruments have been able to examine the universe through a new window, the x-ray part of the electromagnetic spectrum. Bright sources of x-rays have been located and catalogued, and it has been found that the constellation Cygnus contains three bright x-ray objects. One of these, called Cygnus X-3, is probably the most powerful source of high energy photons in the galaxy and has become the hottest topic in astrophysics today. Cygnus X-3 is on the other side of our galaxy, about 30,000 light-years from Earth. It is a binary star system, probably consisting of a neutron-star supernova remnant orbiting a normal star which feeds it

Illustration by William R. Warren Jr.

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hydrogen.

The system has an orbital period of 4.79 hours. That's a remarkably short period: if a neutron star of 1 solar mass were orbiting our sun with that period, its orbit would be less than one solar radius above the sun's surface! The 4.79 hour period can be used as a sort of "fingerprint" to tag radiation from Cygnus X-3, which should change in strength with this characteristic period. This period has been seen in Cygnus X-3 infrared, visible, x-ray, and gamma-ray emissions. The cygnons in the underground experiments have also been found to fluctuate with the same 4.79 hour period. This is confirming evidence that they come from Cygnus X-3. It also means that they travel at essentially the velocity of light: otherwise a spread of lower velocities straggling out across 30,000 light years would wash out the time variations.

Cygnon events observed with the Fly's Eye have truly enormous kinetic energies: up to 20 million times the mass-energy of a proton at rest, or 20,000 times more energy than particles from even the largest earthbound accelerators. Cygnons must have no electric charge because they travel in a straight line path from Cygnus X-3. Their path is not curved by the magnetic field of the galaxy, as the path of a proton or any other charged particle would be. Further, the cygnons are found to make many μ-mesons in their collisions with the atmosphere, suggesting that they are strongly interacting particles (like protons) rather than electromagnetic particles (gamma rays) or weak particles (neutrinos).

The zero charge of the cygnons is intriguing, for all of the known stable neutral particles can be counted on the fingers of one hand with a few fingers left over. The only truly stable neutral particles are photons, neutrinos, and neutral atoms. For good measure we could include the neutron, which is unstable to beta decay with a half-life of 10.6 minutes. There are good reasons for eliminating each of these as cygnon candidates. As all good *Analog* readers know, relativity makes clocks run slower. Neutrons could *possibly* make it from Cygnus X-3 to Earth before decaying if they traveled so fast that relativistic time dilation slowed their internal clock until 10 minutes of internal neutron time became equivalent to 30,000 years of Earth time. But this time dilation factor needs neutrons with 100 times more energy than the most energetic cygnon events which the Fly's Eye has seen.

Neutral atoms can be eliminated because the "empty space" between Earth and Cygnus X-3 is not completely empty. A pipe with a cross section one centimeter square stretching across this distance would contain about 5 grams of interstellar hydrogen. This is several thousand times more matter than is required to strip some electrons from any energetic neutral atom and give it a net electrical charge. Neutrinos can be eliminated because they interact with matter too weakly, and also because the detected cygnons show a "horizon effect," diminished counts when Cygnus X-3 drops below the horizon. The gamma rays from Cygnus X-3 have about the right energy but should, because they are electromagnetic particles, produce only 1/300 of the μ-mesons observed in cygnon events. No

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known neutral particle has all the characteristics of the cygnons. The inevitable conclusion is that the cygnon must be a new and previously unknown kind of particle.

So let's summarize the properties of this new particle. (1) It has no electric charge (and no magnetic charge); (2) it has a rest mass estimated to be somewhere between zero and about 1/20 of a proton mass; (3) it is a strongly interacting particle; and (4) it must be stable or at least have a half-life greater than a day or so. As we have discussed in previous AV columns, the several variants of modern particle theory provide us with a whole beastiary of predicted but so-far unobserved particles: Higgs bosons, axions, gravitinos, monopoles, squarks, photinos, winos, gluinos, etc. Many of these could-be particles fit most of the criteria listed above, but none seem able to accommodate all. The predicted strongly interacting particles are either too unstable or too massive (or both). There is also the problem of how a stable strongly interacting particle with a mass less than that of a π meson could possibly have been overlooked up to now. Cygnons are a profound puzzle, with no solution in sight at this writing (August 1985).

An equal mystery is how Cygnus X-3 could possibly be producing such an enormous number of hyper-energetic particles, photons, and protons as well as cygnons. The raw energy dumped by Cygnus X-3 is ten times greater than that seen by any other identified source of high energy particles. Half a dozen similar objects sprinkled around the galaxy would account for all of the cosmic rays we observe. Cygnus X-3 is a double mystery.

The sociology of modern physics is perhaps not as widely appreciated as it might be. In the pre-twentieth-century Good Old Days physicists like Galileo and Newton could develop theories and perform experiments with equal facility. But in the modern era, this Age of Specialization, there are few renaissance men who can excel in both theoretical and experimental physics. The world of physics is now divided between two specialties, *theorists* and *experimentalists*, working opposite sides of this street which leads to the understanding of the universe. And their goals are somewhat opposite also. The dream of the theorist is to discover some regularity of nature which will allow him to predict what has not yet been observed, to reduce nature to a few beautifully simple equations which will explain everything. The dream of the experimentalist, on the other hand, is to discover a "new phenomenon" which is completely unexpected, is not understood, and which no theory had predicted. Recent examples of this are the Moessbauer effect, the CP violation of the K^0_L meson, and superluminal objects from quasars. Experimentalists keep busy when new phenomena are not at hand by checking theoretical predictions. Nevertheless, it is the *possibility* of finding a new phenomenon that provides a sizable part of the excitement and intellectual stimulation of experimental science and which compensates for the long hours and the less-than-you-could-get-as-a-plumber pay scale.

In the past decade the theorists have definitely been winning in this game. Theory breakthroughs like electro-weak

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unification, quantum chromodynamics, and GUTs have surpassed anything that experimentalists have been able to discover. So perhaps it is time for the experimentalists to have their inning. Cygnons have all the trappings of an important new phenomenon. The testing now begins to see if they are real, and if they are indeed a new kind of particle. And the mysterious energy engine driving Cygnus X-3 demonstrates our need for deeper understanding in astrophysics.

We all are very fortunate to be alive in this age of discovery and scientific adventure. New phenomena are being discovered, mysteries of the universe unraveled as we watch. Even now workers laboring in the deepest mines are unearthing nuggets of the purest gold, discoveries of new and unknown particles coming from the stars, particles which promise changes in our fundamental understanding of the microcosm. I tell you, Readers, it's an experimental physicist's dream come true!

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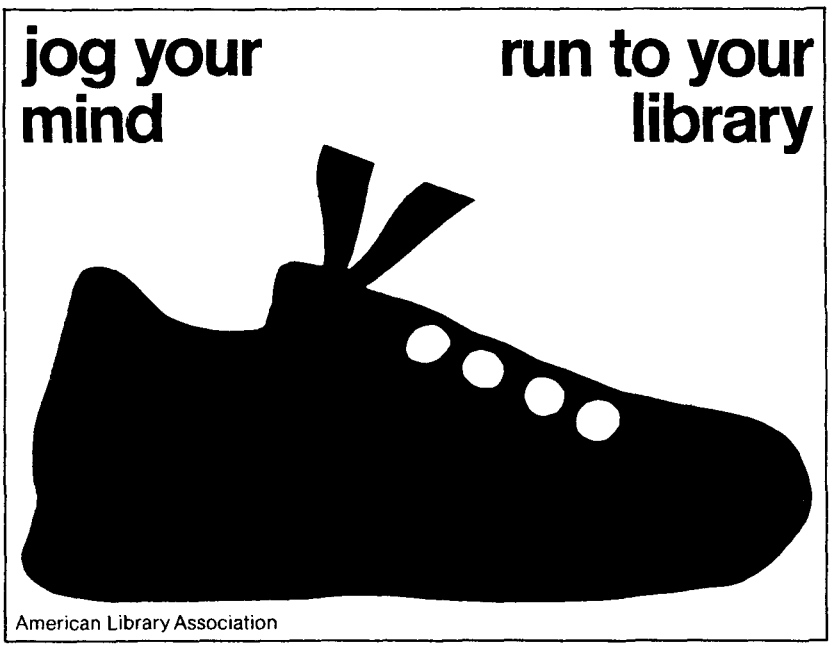

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Frederik Pohl

THE COMING OF THE QUANTUM CATS

What a person becomes is determined
by a lifelong succession of choices.
If, in a physically real sense, *all* possible
choices are taken,
what happens
when all the possible outcomes
are brought together?

Part Three of Four

It is customary to print a disclaimer in novels, saying that the characters are fictitious and no resemblance to any real person, living or dead, is intended. This is, in the case of this story, wholly true, in spite of the fact that some of the characters have names made famous by position and deeds. The reason is that, in each case, the characters portrayed are what the real-life characters might have been . . . if they had been someone other than the persons they were.

SYNOPSIS

My name is **Dominic DeSota.** *People usually call me* **Nicky** *for short. I've got a good job as a mortgage broker; and I've got a good-looking girlfriend, who is a stewardess on the high-speed trains, and all in all the summer of 1983 was a really good time for me, right up until the time I unhooked the top of my bathing suit and was arrested for going topless by the F.B.I.*

At least, that's what I thought it was. It turned out worse than that. They said I'd been seen sneaking around the super-secret research installation of **Daleylab,** *and they had photographs and fingerprints to prove it.*

Well, that was crazy! I'd never been near the place. I didn't even know what they did there—some people said they

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were trying to invent an atomic bomb. Others said they were building some kind of rocket ship that would actually go out into space. Some even said they were inventing something called "television." I didn't believe any of that junk. I did believe, though, that Daleylab was off limits to anybody not cleared by the Arabs or a recognized religious institution, and the last thing in the world I would have wanted to do was to get in trouble with them.

Nevertheless, they had those photographs and prints. The head F.B.I. agent was a woman named **Nyla Christophe.** *She was a terror. Her thumbs had been amputated, which meant that she'd been caught at some serious crime like shoplifting or selling liquor to someone under the age of 35, and how a person like that got into the F.B.I. I couldn't imagine. But there she was, and she had me under arrest.*

Fortunately, I had witnesses who swore that I was somewhere else at the time the surveillance camera took those pictures. Nyla Christophe made my life miserable for a while, but she finally let me go.

Then my troubles really began.

A shady figure named **Larry Douglas** *turned up. He offered to help me by taking me to meet an old retired movie actor, one of those flaming liberals from the old days; he'd been blacklisted by the films for union activity and retired to his home in Dixon, Illinois. About all I knew about Douglas was that he claimed to be the grandson of some old Russian revolutionary named Djugashvili or Stalin or something who'd come to America when the revolution fizzled and started a successful men's-wear furnishings business in New York. I went along with him, though. I had dinner with this old couple, Ronnie and Jane. I didn't really expect much help from them. Who would listen to a has-been movie actor? But I didn't get really suspicious until I began to think that Douglas wasn't particularly interested in me, he was just trying to trap old Ronnie into making some sort of anti-Arab or irreligious remarks. I wondered what he was up to. . . .*

I found out, all right. Douglas was some kind of stoolie for F.B.I. Agent Nyla Christophe, and the way I found out for sure was that when I went to meet my girlfriend at the train station, the F.B.I. arrested me again. Not only me. They picked up the whole crew of the Twentieth Century Limited, my girlfriend Greta included, and this time they didn't intend to let any of us go.

And meanwhile. . . .

My name is also Dominic DeSota, but nobody calls me Nicky. They call me **Dom** *if they know me well enough, but most of the people I meet call me Senator. That's what I am, a U.S. Senator from the state of Illinois and, I think I can say, a fairly important one. I'm on friendly terms with President Reagan, even though we're not of the same party. In fact, I'm even friendly with her husband, Ronnie, the First Gentleman. I was a happy man then, in August of 1983. I had everything going for me, including a love affair with the most beautiful, and maybe the best, concert violinist in the world,* **Nyla Christophe Bowquist.** *(It was a problem that we were both married to other people, but nowhere near enough of a problem for me to think of ever giving her up.) Be-*

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cause Nyla was on the road so much, giving concerts, our time together was limited. But what we had we loved—not only for each other, but for our circle of friends in Washington, like good old Jack Kennedy, my fellow Senator, and his wife Jacqueline, and the Russian ambassador, Lavrenti Djugashvili. They must have suspected what was between Nyla and me, but they never hinted at it. They may not even have gossiped about it behind our backs, because there was never any scandal.

It was a nasty shock when I got a phone call to say that "I"—they swore it was I—had been seen in the Cathouse at Sandia National Laboratories in New Mexico.

See, Sandia was secret in itself, because all sorts of research went on there. The Cathouse was the most secret of all.

Hardly anybody knew about the Cathouse. Even most senators didn't—except a few people like me, because we were on the oversight committee that was in charge of all secret defense work. You see, there were some scientists who thought that there were an infinite number of parallel worlds, similar to our own, but differing in detail—say, in one of them the American Revolution never occurred and we were still subjects of the Queen; in another a meteorite had wiped out the human race; in another organic life had never evolved at all on Earth—well, there were an infinite number of possibilities; and also an infinite number (they supposed) of "paratime" worlds. Of course, there was no real evidence of this. There was only mathematics. But the mathematics made them believe that this was so, and that it might even be possible to peep into, perhaps to travel into, such paratime worlds.

All this has to do with what they call "quantum mechanics" and they tried to explain it to us ignorant senators by quoting a man named Schroedinger. He is supposed to have said something like, "Suppose you have a sealed box with a cat inside it. The cat is either living or dead, but you can't know which until you open the box—so the best you can say, before opening it, is that there is a fifty-fifty chance of the cat being alive. But a cat can't be fifty per cent alive. It has to be one or the other. And what this really means," Schroedinger is supposed to have said, "is that it is both *alive and dead—but in two separate universes."*

I can't say we really understood that, but the military implications were obvious, if it were true, and besides it was a really cheap project to run. So we authorized it; and we named the place where that particular research was done the Cathouse, after Schroedinger's cat.

It was there that "I" had been caught.

Naturally, I flew out there at once. I confronted myself, and by God it was *myself—same retina prints, same bone structure, in every testable way this man who called himself* **Dr. Dominic P. DeSota** *was me. But he wouldn't talk. He wouldn't say how he was there, or why; and just when I was beginning to wonder if we shouldn't go against all my principles and use some kind of force to make him talk, he disappeared.*

But that wasn't the end of it.

On my way out of the building we were surprised by a squad of soldiers.

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Their commander was another me, this one wearing a major's gold leaves on his battle dress; and he took us prisoner. The United States, he told us, was being invaded—by the United States; and if we knew what was good for us we would surrender.

My name is Dominic DeSota, too, but I'm not the Senator. Nor am I either the poor mortgage broker, Nicky, nor the Major who led the first attack force from Time Gamma to time Epsilon's research facility at Sandia. I'm Dr. DeSota, theoretical physicist, and I wish I had stayed with theory, because this whole thing is at least partly my fault. I didn't invent paratime. But I did have a lot to do with making it possible to cross from one time to another.

I used to be proud of that.

When we first began putting objects, then people, through to other times, we were aware of problems. One was what we called "ballistic recoil." There is a conservation law which means that if something is added by transport from one time to another, something else is sucked into the first and expelled from the second. This meant that windows were opening between times that were not under our control, and so people in one time saw and heard things from another. Sometimes physical objects were transported. Since we were operating on a pretty small scale, we could afford to ignore that.

We thought.

The other main problem was not scientific. It was, I guess you would say, political—or military, perhaps—anyway, we wanted to know if other times were likely to be able to peep us, and project persons or things in on us, as we could to them.

So we sent out scouts.

I went myself, often enough. I went to Daleylab to see what they were doing (not much; it was quite a backward time, the one we called Time Tau). And I went to the Cathouse in Time Epsilon, just before the invasion from Time Gamma led by my other self, Major Dom DeSota.

I got back safely every time, but unfortunately I wasn't the only scout who went into other times to snoop around. One of the first was my associate, **Dr. Larry Douglas.** *He'd gone into Time Gamma a couple of years earlier . . . and he hadn't come back. They caught him.*

I don't know what I would have done in Larry's place, but I hope I wouldn't have blurted out the truth. And I am almost sure that I wouldn't have gone on to tell them everything I knew about paratime—enough so that, in less than a year, they could develop their own paratime gates. . . .

And use them for war.

They weren't really declaring war against the other United States. Their enemy was the Soviet Union. All they wanted from the United States of Time Epsilon was free passage to the dismembered and powerless U.S.S.R. of Epsilon, so that they could first spy, then insert nuclear weapons upon, the vastly more powerful and dangerous U.S.S.R. of their own.

The plan might have worked, if they had gone about it the right way—that is, if they had used persuasion and an appeal to common interest, maybe with a few bribes thrown in.

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They didn't. They used force. They invaded the Sandia Cathouse with assault troops, demanded President Nancy Reagan's capitulation; and when they didn't get that, they launched an armed attack on Washington, D.C. itself.

Unfortunately, I got caught up in all this personally.

My former colleague (and now chief scientist of the Time Gamma attack) Larry Douglas, along with my other self, the prisoner Senator Dom DeSota, managed to get away from the Gamma authorities by plunging through the gate into another time. It turned out to be Nicky DeSota's Time Tau . . . and let him tell you what happened then.

26 August 1983
6:40 A.M. Nicky DeSota

I was dreaming that Mrs. Laurence Rockefeller had asked me to arrange the mortgage for a six hundred million dollar apartment complex along the lake, only she wanted to start with a down payment of $150 because all her money was tied up in dimes . . . and then when I finally got the papers ready to sign she couldn't do it because she didn't have any thumbs. And then, as the bumping of the plane landing woke me up, the first thing on my mind wasn't where I was, or what was going to happen to me, but whether Mr. Blakesell had known I was arrested in time to get someone to cover my three mortgage closings. There wasn't anything I could do about it, of course.

There wasn't anything I could do about anything, because I was handcuffed to the back of the seat in front of me. My first long-distance flight in one of those new big Boeing four-engine jobbers should have been a real thrill. What it was was a pain. I mean, real pain. I was aching from being in that same seat for eleven hours, and two intermediate stops, and God knows how many hundred, or even thousand, miles; but the big aches had been with me even before they put me on the plane in the first place, wobbling up that ladder with my hands cuffed behind me and that ugly F.B.I. man, Moe Something-or-other, threatening all kinds of doom if I spoke, or tried to get away, or tried to take off the hat and veil they'd made me wear so nobody would know who I was. He knew all about those aches, too. He'd given me most of them.

I will say for the F.B.I. boys and girls, they really know how to hurt you without leaving marks.

Across the aisle, the other prisoner was awake inside his own hat and veil. I could see his head moving. His guard was snoring as lustily as my own as we bumped interminably along runways that seemed to go nowhere.

At least I was out of the holding tank in the Chicago headquarters, where I'd spent most of the last—what was it? Days, for sure, though nobody would tell me how many. It had been pretty bad, in there with that bunch of social undesirables—muggers on the way to the concentration camps, currency speculators held for trial—but it was better than the times they took me out to ask me more questions. I hadn't told them anything, of course. I hadn't had anything to tell—but, my God, how I wished I had!

And then Moe had come in, waking me up, and dragging me out. And we'd

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wound up in this plane, going God knew where.

No. Both God and I knew where, now, because through the veil and the tiny window I could see a gaudy, foreign-looking terminal, with a big sign that said

WELCOME TO
ALBUQUERQUE, NEW MEXICO
ELEVATION 5196 FEET

New Mexico, for heaven's sake! What in the world did they want with me in New Mexico?

Of course, Moe wasn't going to tell me. The stewardess came by and tugged his shoulder to wake him, and he leaned over to wake the other guard, but all he said to me was, "Remember what I told you!" I remembered. He made us wait until all the other passengers had got themselves out of the plane. Then he made us wait some more, while mechanics came out to turn the big propellors around a few revolutions and a truck backed up with 100-octane gasoline to refill the tanks.

Then somebody waved to us from the terminal door.

Moe unlocked my handcuffs and we left, me trying not to stumble as we clambered down the steep aisle to the stairs, and then down the stairs. The other prisoner followed behind us with his own guard; and they whisked us through an airport terminal that looked as though it had been built as a set for some Latin-American musical comedy. People stared. The overly curious were pushed roughly out of the way—there weren't too many of them, because the F.B.I. goons weren't hard to recognize, and most people turned the other way fast. Into a car, me and Moe on the jump seats, the other prisoner and his guard behind us. A city police car pulled out ahead of us, and we went blasting away, God knows how fast, through city streets and out onto a two-lane highway that snaked away up into the hills.

We drove for nearly an hour. We wound up at a crossroads, two empty highways stretching to the compass points, and a filling station with a motel behind it. The sign over the office said La Cucaracha Travelers Rest, which was not a name I would have given to a motel.

I also wouldn't have put armed guards in the driveway.

The guards were, however, a little decorative touch that I had begun to get used to. So there were good signs and there were bad signs. The bad sign was that I was still under arrest. The good sign was that I wasn't being taken to Leavenworth or one of the camps, where I would disappear from sight until they got good and ready to let me out—if ever. This was no permanent island in the F.B.I. archipelago. They could not mean to keep me here for very long. They might even let me go.

Alternatively, what part of me might come out of the Cucaracha Motel might be only enough to send home to bury.

I wasn't given enough time to worry. My silent colleague and I were hustled into one of the cabins and ordered to sit on the edge of the bed and keep quiet, while Moe stood inside the door, glaring at us, and the other one stood right outside. We didn't have long to wait, though. The door opened from outside. Moe moved out of the way without looking to see who it was.

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Nyla Christophe strode in, her hands clasped behind her.

She was wearing a sun hat and dark glasses. I could not see her expression, but I could tell that she was gazing at us thoughtfully—I could feel the burning, like acid, where her eyes raked across my face. But her voice was only normally unpleasant when she said, "All right, you guys, you can take those dumb veils off now."

I was glad enough to do that, because I was stifling inside that thing in the desert heat. The other fellow moved more slowly and unwillingly; and when the veil was off his expression was scared, resentful, unhappy—all the things I would have expected; but what I hadn't expected was that the face that wore the expressions belonged to Larry Douglas.

What I was absolutely certain of was that Larry Douglas was at least in part responsible for the last four or five days of misery. How, I didn't know. Why, I couldn't even guess. So I was not in the least sorry to see him caught in the same trap he'd helped me into . . . only that just made it all even more confusing! If he had passed on to Nyla Christophe all the things I'd told him when he dragged me down to see that beat-up old movie actor downstate, why was he a prisoner, too? And what were we doing in New Mexico?

The good part of that was that Douglas seemed as baffled as I. "Nyla," he said, his voice unsteady with anger he was trying not to show, "what the hell is this all about? Your guys come and grab me, drag me out of bed, won't tell me a word—"

"Sweetybumps," she said cheerfully, "shut up." Even with the dark glasses on he could read enough of her expression to swallow hard. He shut up. "Better," she said; and, over her shoulder, "Moe?"

Rumble from the ape-man: "Yes, Miss Christophe?"

"Is the mobile lab here yet?"

"Parked right behind the cabins, all ready to go."

She nodded. She took off hat and glasses and sat in the one lumpy armchair the room possessed, extending a hand without looking. Moe put a cigarette into it, and followed with a light. "It is possible," she said, "that you two guys are in the clear on this particular matter. We need you to check some things out."

"Oh, good, Nyla," cried Douglas. "I knew it was just some mistake!"

And I managed to say, what I am ashamed to admit I hadn't really been thinking about for some time, "What about my fiancee and those others, Miss Christophe?"

"That depends, DeSota. If the tests come out the way I think they will, they'll all be released."

"Thank heaven! Uh—what tests are we talking about?"

"The ones you're going to have right now," she said. "Get on with it, Moe." And she left the cabin, while the other goon came in with an armload of stuff, followed by a man in a white jacket and another armload.

I couldn't help cringing, but it turned out that not even Moe was going to beat me up again. What they had in mind took longer, but was nowhere near as unpleasant—well, it wasn't exactly *fun*. They took my fingerprints and my toe

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prints. They measured my earlobes and the distance between the pupils of my eyes. They took blood and saliva and skin samples, and then they made me pee into a bottle and move my bowels into a paper cup. It took a long time. The only thing that made it less obnoxious was that my obnoxious fellow prisoner—the mystery-man Larry Douglas, my co-conspirator from the Carson coffee shop and fellow traveler to the Reagan place in Dixon, Illinois—was doing the same.

And liking it even less. Neither Moe nor the other guard liked it a whole lot, either. They went outside, watching through the window, while the lab technician took his samples and signs, so Douglas and I were able to talk a little. The first question I asked him was the one I'd been brooding on for a long time: "What the hell are you? Some kind of undercover Fed?"

He had a hangdog look, but even a whipped dog can snarl. "None of your damn business, DeSota," he snapped. He watched my blood being sucked up into a syringe, holding his own arm where the silent lab man had just done the same to him.

"Well, what are you? Nyla Christophe's boy friend, or fink, or prisoner?"

He said simply, "Yes." Then he let down his pants so the lab man could take a chunk out of the flesh of his butt. "If I were you, DeSota," he said darkly, "I'd worry about myself instead of some other guy. Do you have any idea how much trouble you're in?"

I laughed in his face. All the aches and miseries of my body told me how much trouble I was in. "Anyway," I pointed out, "she said we might be in the clear here, so what have I got to worry about?"

He looked at me with pity and contempt. "That's what she said," he agreed. "But did you ever hear her say anything about letting you go?"

I had to swallow hard before I could ask, "What the hell are you talking about, Douglas?" He shrugged, looking at the medic. He let me stew until the man had taken all the little bits and tricklies and probings he wanted and departed with them. Neither of the guards came in after that, though we could see them sitting on the rail, fanning themselves as they gazed out across the highway. A streamliner was arrowing along the rail line just across the highway, and I thought with a sudden pang of Greta. I repeated, "What are you talking about? She said she'd probably let us go—"

"Not 'us,' DeSota. 'Them.' The other witnesses, who don't know anything. You're a whole different animal. You know a lot."

"I do?" I searched my brain, came up empty. "Good lord, man, I don't even know what she wants with me!"

He said gloomily, "The big thing you know is that there's something to know, and that's the biggest thing of all. How did you manage to be in two places at once?"

"How the hell do I know?" I cried.

"But you know that it happened," he pressed. "So you know that it's possible. So you know that somebody—say a criminal—could do something, say commit a murder, in one place, and have a hundred good witnesses to swear that he was someone else. Jesus, boy!

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Do you know what that would mean to somebody like me?—I mean, somebody who needed that kind of alibi?'' he corrected himself.

''But I don't know how it was done!'' I wailed.

He said sourly, ''So I found out. Wake up, will you? Do you think Nyla's going to let you go home and tell people that such things can be?''

I sat down, shaken.

I could see the logic to what he said. The stories were that the F.B.I. camps were full of people who were unfortunately in possession of information that couldn't be allowed to become public. If I was one. . . .

If I was one, my next stop wouldn't be Chicago. It would be a road gang in the Everglades, digging drainage ditches and fighting off alligators—or cutting down trees for that endless road in Alaska— Anywhere. Wherever. The exact place might be in doubt, but what was sure was that, whatever it was, that would be my permanent address, at least until the time came when my secrets were no secrets any more.

Or until I died. Whichever came first. And I was pretty sure that after a year or two in the camps, I wouldn't *care* which came first.

When the shadows of the flagpole outside had nearly disappeared, because the sun was straight up, they brought us ham and cheese sandwiches wrapped in wax paper and terrible lukewarm coffee out of a machine—both from the filling station in front of the cabins. I was starving, but I took no pleasure in them. I slowly put them away, and was ready with the empty cup and wrappings when the door opened to take them out.

Only it wasn't Moe or the other guard come for that. It was Moe, all right, but he stepped aside, and after him entered Nyla Christophe. She had a sloppy grin on her face. In one thumbless hand she held a bottle of champagne, cradled against her chest so it wouldn't fall. ''Congratulations, boys,'' she said. ''You passed. You're exactly the same.''

Neither Douglas nor I said a word. She pouted. ''Aw, hon,'' she said to Douglas, giggling a little—it wasn't really a reassuring giggle, ''don't you see this is my way of telling you I'm sorry, *Glasses*,'' she said, in quite a different tone, and the second goon stumbled in his hurry to get into the room with his tray of thick hotel tumblers. She jerked her head. The two of them left, and she gave the bottle to Douglas. ''That's the way, sweetie,'' she said, watching him as, looking more at her than at what he was doing, he began to peel the foil off and thumb back the cork. ''Glad to see you haven't lost your touch.'' There was something in his worried (but faintly belligerent) and her tender (but not so faintly mocking) expressions that told me I didn't know all that was going on. Whatever the relationships between them, they were not just a matter of Federal agent and informer.

Then *pop* went the cork.

Douglas poured. Nyla Christophe accepted the first glass, wrapping all four fingers around it securely enough. ''Know what I'm talking about?'' she asked. With a hiccup—this bottle of champagne, I thought, wasn't her first that day. I shook my head. She said,

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"Thought not. The tests came out perfect. Same blood, same bones, same prints. You're the same guys—and my report's on the way to headquarters, and that's where I'll be before long myself. So let's drink to Nyla Christophe, next maybe Deputy Chief of the whole damn Bureau!"

I drank her damn champagne. I drank it partly because I didn't particularly want to make her angry, and partly because a guy like me doesn't get imported French champagne every day, and most of all because I didn't know what else to do. Maybe Douglas was right! Maybe this was so big a thing that Nyla Christophe really could get a big promotion out of it . . . and in that case maybe he was right about the rest of his nasty remarks, too.

I wondered what Greta would do when I just never showed up again. Maybe they'd let me write? At least to say good-by?

It was not good news for me, what Nyla Christophe said, but Larry Douglas thought it was for him. "That's *swell*, hon!" he enthused. "Boy! You'll show them in Washington. And, listen, I've got a lot of ideas for you! This business of establishing two identical identifications—did you ever think what that might mean to the Bureau? I mean, infiltrating subversive organizations, for instance? I don't know exactly how it works, of course, but—"

Christophe let him go on, a dreamy smile on her face. While he was still talking she came over beside him and ran her hand down his back in a friendly way. "Sweetie," she said affectionately, "you're a real jerk."

He swallowed. "You—you don't want to take me with you?" he stammered.

"Take you? That's the fucking last thing I would do, Larry hon."

He blazed up. "Then let go of me, damn it! You've got no business sweeting me up like that!"

She let her smile grow deeper. She was actually quite good-looking when she wanted to be. I thought I saw actual dimples above the corners of her mouth. "Larry," she said sweetly, "maybe there are some other people who can get on my back for making love when I don't really mean it, but you're sure not one of them."

I had no idea what she was talking about. He obviously did. His face went gray. "You don't know shit about it," she told him. "It's a lot bigger than you could possibly guess." She glanced at me. "Want to know what's going on?" she asked.

Oh, boy, did I! I didn't have to answer. She knew the answer and went right on. "Let me start from the beginning. Suppose—"

She hesitated. Then she shrugged and grimly raised her right hand, the four fingers spread and the missing thumb nakedly shockingly obvious. "Suppose I hadn't got into trouble with the law when I was seventeen. Suppose I grew up in a normal way. My life would have been a lot different, wouldn't it?" I nodded, meaning I guessed so but I was too lost to have a useful opinion; Douglas just went on looking stricken and grim. "So there might have been one life in which I grew up just the way I did—the way I am now, right? And there could have been another one in which I be-

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came—oh—I don't know. A musician. Maybe a concert violinist."

Her expression didn't really change, but I got the idea from something in her eyes that she was waiting to see if I would laugh at that idea. I didn't laugh. "See, I would have liked that at one time," she said. "And the thing is that you can't say one of those possibilities is real and the other is just imaginary. Not any more. Because they're both real. All the possibilities are real, maybe. It's just that we only live in one possibility, and we can't see the others."

I darted a glance at Douglas. He was as lost as I was, and a lot more scared—probably, I thought with a sinking feeling, because he knew more than I did about what was likely to happen to us.

"Hell with that," she said suddenly. "Come on, I'll show you. Moe!"

The door popped open, and the bigger goon filled the doorway. Nyla pushed past him, beckoning for us to follow. It was unbelievably hot outside in the sun. Her footsteps were unsteady—partly sun, partly high heels in the sand, mostly, I thought, either champagne or pure delight in her probable future. She led the way to another cabin, with a previously unobserved F.B.I. man hulking in front of it. When Nyla Christophe nodded he threw the door open. She peered inside, then nodded to Douglas and me.

"Take a look," she invited. "Here's two good possibilities for you."

I still did not have an idea in the world what she was talking about, but I did what I was told. There were two men in the room. One was over in the corner, gently patting cream onto one of the worst cases of sunburn I'd ever seen. He had no shirt on, and he was lobster red to just above his wrists, and down to a V around his neck. With his hands over his face I couldn't get a good look at him.

The other was closer, and not moving. He lay flat on his back on one of the beds, his eyes closed, snoring. He looked like he'd had a hard time. I don't mean just the routine hard time that you expect when you are an F.B.I. prisoner, I mean he looked half dead. And he looked—

"Douglas!" I yelled. "It's you!"

Douglas didn't say a word. It hit him harder than it did me. He was strangling, eyes popping. I could see he was trying to ask a question, so I asked it for him. "What's the matter with him?" I asked.

Nyla Christophe shrugged. "He'll be okay. Sunstroke and exposure, and he got himself bitten by a rattlesnake. But he's had all his shots, and the doc says he'll be good as new tomorrow. But you didn't take a good look at the other guy yet, did you?"

And so I did. And he turned and looked at me. And the face was sunburned and raw, and the expression was grim, but the face was a face I knew very well.

"My God," I said. "He's got to be the guy from Daleylab!"

"Close," said Nyla Christophe cheerfully, "but he says he's not. He says lots of things, DeSota, things you wouldn't believe; he's been talking steadily ever since the train crew picked the two of them up in the desert last night. He says all those possibilities are really real and that there's plenty more

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like him around—in one of those possibilities or another. But you're kind of missing the point, DeSota. What he mostly says—and what all the tests say, every one of them—is that he's *you*."

At this hour of the night the big underground parking garage was deserted, and the lawyer wished he hadn't worked so late as he tried to remember where he'd left his car. You never could find a policeman when you needed one! He felt he needed one now—two rapes, a murder, nobody knew how many muggings in the garage in the past few months. Then he rounded a corner and saw two uniformed men patrolling, with tommy-guns slung over their shoulders. "Good evening," he said, feeling better at once—until he observed that their uniforms were gray-green shoulderboarded things, with forage caps quite unlike the checkerboarded ones of the Chicago police force. Worse, when they challenged him he recognized the language. Russian! Instinctively, he turned and ran, his shoulderblades crawling. He heard a burst of shots, but no bullet struck him. And when stuck at a dead end and he turned, sobbing, to confront them, they were gone.

26 August 1983
7:40 P.M. Senator Dominic DeSota

All that afternoon I had been staring longingly out the window at the pocket-sized swimming pool in the courtyard, sweating by the bucket and my sunburn tormenting me every minute. It wasn't just the sunburn or the heat that tormented me. Somewhere not far from here—but hopelessly walled away from me by whatever it was that separated one time-line from another—my country was being invaded, and somebody wearing my face had gone on television to give aid and comfort to the invaders. I could not remember any case in the history of the United States since the Civil War when any elected U.S. Senator had done anything like that. What were my colleagues thinking of me?

What was Nyla Bowquist thinking of me?

I didn't even know what I thought of myself any more. The last forty-eight hours had been the worst of my life. It had been a terrible shock to find out that the Cathouse represented some kind of reality, and that there were infinite numbers of worlds just like my own, many of them with a Dominic DeSota, indistinguishable from me by any test. I had been taken prisoner by one of them. I had knocked out a woman who was, exactly, the woman I loved, and been held prisoner by another copy of her, not quite exact because of her mutilated hands. I had kidnapped a man. I had suffered the shock of invasion of my country *by* my country. And I had suffered the damnedest worst case of sunburn, trudging through the empty desert without food or water, of my life, and it *hurt*.

One way or another, it all hurt . . . and they wouldn't even let me get in that pool to cool off.

It wasn't forbidden, exactly. It was just something that could not be permitted by anyone but that other Nyla, and she was off on some errand of her own. The washbasin in the corner was no substitute. Every half hour or so I would splash water over my bare skin; on the quarter hour I would try gingerly

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to put on some of that useless sunburn cream they'd dug up for me. Those things gave me something to do. They didn't much help.

What also didn't help was the presence of my involuntary traveling companion, Dr. Lawrence Douglas. Most of that long day he lay unmoving in the bed. That I could understand. He'd gone through most of what I had: the same sunburn, the same endless hours of heat and thirst, wandering through the empty desert. And worse. Not only had he managed to get himself snake-bitten, and had the antivenin shots that were almost as bad as the bite, but he'd been shot full of pep juice of some kind so Nyla No-Thumbs could interrogate him. I hadn't been there to share it, but when they put him back in our room, by then unconscious again, he'd had bruises to add to the burn.

I didn't try to wake him.

I didn't have to wake him. When I turned unexpectedly away from the washstand I caught his eyes on me. He closed them at once, but not in time. "Oh, hell, Douglas," I said wearily, "if you want to sleep, sleep; if you want to wake up, wake up; but what's the use of faking it?"

For another stubborn minute he kept them closed, but he couldn't keep it up forever. He dragged himself out of the bed, looked around for the toilet that didn't exist and then, without speaking, urinated into the washbasin.

When he finished I snapped, "At least rinse the damn thing out!" *I* had. He didn't look around, but he turned the taps on full, sloshed the water around, drank, as a dog drinks, lapping the water out of his cupped hand under the tap, all without speaking.

"If you wet your hair it'll help a little," I told him. "Also I've got some sunburn cream."

He straightened up slowly, then bent again to do as I suggested with his hair. Over his shoulder he muttered something. It could have been "Thanks." I decided to assume it was, and when he turned back to look for the sunburn cream I managed a smile.

He didn't smile back. Even allowing for everything, I have never seen a man look more hopeless, resentful, and depressed.

Of course, I was in no good mood myself. Apart from the things that had happened, I was feeling itches and twitches I didn't like. I felt I was under constant observation, though I could never catch the guard peering in the window; and I felt another itch I liked even less. "Look," I said, "it's no good sulking."

He paused in putting cream on his tomato-colored face to look at me sourly. "So what *is* good, would you suggest?"

"Well, you could satisfy my curiosity about something, because I've been thinking. When I got up on the scaffolding where you were working on the portal and you went through it with me—"

He barked a nasty laugh. "When you forced me at gun-point," he corrected.

"Yes, all right. When we wound up ten feet in the air on the other side, because you didn't tell me there was going to be a drop," I amplified, for no better reason than to spread a little guilt back on him, "I thought we were going

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back to my time. Then, while you were sleeping, I thought about it."

He groaned. "DeSota, if you're coming to any point, will you please get there?"

"The point is, what were you doing?"

"Trying to escape," he said shortly.

"To here? But this isn't your own time, is it?"

"This primitive hell-hole?" he snarled. "No!"

"Then—"

"Then why didn't I try to get back to my own? Because I don't have one, DeSota! Not any more! There's only one thing I want now, and that's *out*."

He flung himself back on the bed. "But, listen—" I began reasonably.

He shook his head. "Forget it," he said.

And, along about that time, I did. Not because of what he said. Because a car roared into the driveway and stopped out of sight. I craned my neck to see what was happening. No luck. I heard car doors slam, and distant voices —rumble from a man, higher-pitched, cheerful sound of a woman's voice. A voice I knew well. And a moment later Nyla appeared, walking toward the pool, shedding clothes as she got near. She didn't bother to glance at our window. She got to the edge of the pool, tested the water with a bare toe, slid out of the last of her underwear and dived cleanly into the pool, the thumbless hands pressed together over her head.

And that other itch that I had not wanted to feel came rushing back to fill my nerve ends with longing.

If Nyla No-Thumbs didn't look at us, we certainly looked at her. I could see one of the guards, half hidden by a porch pillar at the motel office, eyes missing nothing of that handsome, familiar body. Even Douglas lifted himself off the bed to join me at the window. "Hell of a good-looking putaine," he muttered.

I could have killed him.

To feel anything of the sort, of course, was purest insanity. I told myself that. I couldn't help it. Because for quite a while now what had been filling the cracks in my mind, the parts I didn't want to explore, was Nyla. Each Nyla. All the Nylas. Nyla Bowquist, my true love violin virtuosa; Nyla Sambok, girl paratrooper; Nyla No-Thumbs. Nyla Christophe, that was—obviously never married, because who would marry her?—zealot law-enforcer, commander of goons and rubber hoses and secret prisons.

And they were all the same one. I didn't need fingerprints or urine analyses to know that. I felt it in my groin, with an intensity seldom matched since I was fourteen years old, peering through the cracked partition to the girls' locker room at the Y.

There were so many incongruities that I didn't know where to begin to look for a handle to them. That first one, the sergeant—she was bad enough, as a shock to my nervous system. But at least, after that first appalled recognition, she made some kind of sense. If she wasn't a concert violinist, at least she was a music teacher; if not a civilian, at least only a draftee. My own beloved could have gone the same way, given a few acts of God one way or the other in her early life.

But this one!

This thumbless one . . . without kindness, without love . . . most of all,

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without thumbs! I could not recognize my darling in her at all.

But I could recognize my darling's body. My own body knew it at once.

Almost I understood that overwhelming itch, because I'd heard of such things—no, not *such* things; but something similar. One of my old political drinking buddies had told me something once, at one of those beery four A.M. sessions when you're exhausted from speeches and handshaking and watching the election results come in, and everybody else has finally gone home. He said he'd caught his wife in an affair with another man. When he couldn't doubt it any more, he was pained and furious—and something else. He was incredibly horny. All through the fights and scenes and confrontations, the biggest thing on his mind was to make love to her, as often and as forcefully as he could. To take this familiar stranger, this hostile love, this person whom he had suddenly discovered that, having thought he knew her intimately and totally, he hardly knew at all—to take her to bed, because the burning and yearning in his crotch outweighed every other feeling he had.

Staring out of that window, I wanted Nyla very badly indeed.

Any Nyla at all.

Grotesque? Of course! I knew just how grotesque it was. And yet I couldn't help thinking—what would it be like without thumbs? In what ways would our love-making change? For instance, she did sometimes mischievously tweak my useless little nipples while I was tweaking hers; we had giggled over the differences between hers and mine, and the impossibility of ever knowing whether that tiny tickle I felt when she pinched mine was in any way like what she felt in hers. But, thumbless, she couldn't do that—or not exactly that—or what would it be like, really?

I cannot put in words how badly I wanted to know.

Spang went the window screen as the big guard, Moe, came up from the side and caught me staring. He slapped it with the flat of his hand and I pulled away, tiny flakes of rust stinging my eyes. "Got hopes, have you?" he jeered. "Forget it! She's not for jailbirds like you, even if she is treating you better than you deserve." He disappeared and I heard him unlocking the door. "God knows why she thinks you rate it," he grumbled, motioning us out, "but she brought you some food. And she says you can eat it in the owner's apartment, and it's got air-conditioning."

The food was Mexican, on cardboard plates and just about cold—well, nothing was cold, really, in that part of New Mexico, but no more than room temperature. And the room was, as promised, cooled down to the merely uncomfortable by a wheezing, rattling box in the window of the large living room. It wasn't enough. Our two doubles were there with us, along with the guard, Moe, and body heat was enough to drive the temperature right back up again.

I sat next to the other DeSota and we eyed each other. "Hi, Dom," I offered. He looked surprised.

"They usually call me Nicky," he said. "Say, did you *see* her out there? And they busted me for just going top-

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less!'' I opened my mouth to ask him what he meant, but once started talking he kept right on. ''Are you really a United States Senator?''

''Since 1978, right. From Illinois.''

''I've never talked to my Senator before,'' he said, and grinned. ''Especially when he was me. What should I call you?''

''Under the circumstances, Dom is good enough. And you? Nicky? That's funny—I mean, I don't know why. Even when I was a kid, my mother didn't call me Nicky.''

''My mother didn't either, but when I was training for the job my counselor advised a change. 'Dominic' sounded too much like 'dominate,' he said, and customers would be put off by it. I'm in mortgages.'' He hesitated, mouth full of refried beans. ''Dom? How'd you get to be a Senator?''

Meaning, of course, *when I'm just nobody?* But how do you answer something like that? I couldn't say, ''Because I'm a winner and you're a wimp.'' That would be unforgivable and, worse, untrue, since we were the same person. What had happened in his world to make my gentle fiddle-player a ruthless hunter of men, and me a wide-eyed innocent?

I didn't get a chance to find out. In came Moe, lugging a cardboard carton as though it were heavy, and behind him Nyla Christophe. She had her clothes back on now, a skirt and a modestly long-sleeved blouse, though from the way they molded themselves to her I wasn't at all sure she had anything underneath them. ''Enjoyed your dinner, fellows?'' she asked cheerfully. ''Now you've got to sing for your supper. I went to the Albuquerque office to talk to Washington on a secure line, and it's working out just the way I thought. There'll be orders for us all tonight!''

She nodded to Moe, who put the box down on the floor and began pulling stuff out of it. A big thing with two turntables that he plugged into a wall outlet, a couple of huge reels of magnetic tape, a microphone the size of my fist on a long cord. The other Larry Douglas, the one who had not come with me through the portal, said worriedly, ''Nyla? What kind of orders are we talking about?'' She grinned and pointed an index finger up toward the sky. *''Washington?''* he squealed, his voice changing with sudden tension. ''But, listen, Nyla, I don't know diddly-shit about any of this—''

''You do now, lover,'' she said fondly. ''Moe? You ready to record?''

''I am now, chief,'' he reported, having threaded tape from one reel to another. He flipped a switch, and inside the criss-cross metal on the front of the box I could see vacuum tubes—*vacuum tubes!*—begin to glow.

''So what we're going to do now,'' said the woman who wore the coveted body I loved, ''we're going to take all your statements over again. Don't go volunteering any extra information,'' she said darkly, directly at that Douglas. ''Just answer what I ask you. The Director isn't going to want to hear anything about what you were doing in Chicago, or whether you like the treatment you've been getting. Just the essentials; because I'm going to have this whole thing wrapped up before we get on the plane!''

Considering all the questions I had

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been asked, considering the circumstances of what all of us had to say, I could not see this particular series of interviews ending much before daybreak. I was wrong about that. Nyla Christophe knew exactly what she wanted to have on the record, and asked only what she wanted to know. Nicky DeSota was up first. On request he gave his name, his address and something called his "Civilian Registry Number." After that there were only two questions:

"Have you ever been inside Daley-lab?"

"No."

"Have you ever seen the man present here who resembles you and describes himself as Senator Dominic DeSota before today?"

"No."

Nyla jerked her head and swept him away, and the local Larry Douglas took his place. For no more elaborate an interrogation. It was the same two questions, except that the man present who resembled him was "Dr. Lawrence Douglas." He gave the same answers, and I was on stage.

I took longer. She ordered, "Start with your being advised that someone like you had been captured in a secret military installation in New Mexico and tell us your story." And she just listened, prompting me with what-happened-next sort of questions and nothing more, except that when I got to the soi-disant major-me who had taken me prisoner, she put in, "Was this man the same as the one who allegedly disappeared while in custody? No? Or the same as the one here present? No? So then you say there are at least four of you? Yes? Then go on."

And I went through the whole thing, even my knocking out the other Nyla, except that I didn't mention the kiss, and most of all I didn't mention that she was indeed a Nyla. "Sergeant Sambok" was description enough. I wasn't asked for more. "And then we landed in deep sand, and there was nothing in sight but desert. There was nobody around. It was burning hot. We had to get out of sight as fast as we could, or anyway we thought we did. We headed southeast, as near as we could tell from the sun. We walked for hours, getting thirstier all the time. Then Douglas said he'd heard that some of the cactus had water inside them, and he tried to pull one of them out of the sand, and there was a snake under it." I hesitated, wondering how much detail the woman wanted. I'd heard the rattles before I saw Douglas jump back, with the snake dropping off his sleeve. It wasn't very big, and the fatigue fabric was tough, so not much venom got in. The funny thing was that he hadn't made a sound, just looked more astonished than any other human being I had never seen. "By then we had come to a railroad line. We just stayed there until the train crew spotted us."

"Right," said Nyla No-Thumbs, nodding to the apeman. He clicked off the recorder and began the laborious task of changing reels. If Nyla had no thumbs, this man was all thumbs, but she was patient. She had dismissed me entirely. She was devoting all her attention to my involuntary traveling companion, who looked uneasy. I could understand why, because there was something in the gaze she bent on him that I could not quite identify. It was

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almost—but how could that be? — seductive; and at the same time there was an unmistakable threat. She gave him a warm, sweet smile. "You're on next, hon," she said.

If the first three of us had managed to fill only one reel, this Dr. Lawrence Douglas looked likely to fill every one of the half-dozen spares Moe had brought. Nyla's questions were sharp and to the point; from time to time she referred to a notebook to make sure she was missing nothing.

He started with a surprise. "In the first place," he said, glancing at me with considerable dislike, "the timeline I was kidnapped from is Paratime Gamma. That's not my original one, but—"

"Just a minute, hon. What's 'Gamma'?"

"It's what we call it," he said wearily, "because you have to have some way of identifying them. My own is Alpha. This one is Tau. The Senator's is Epsilon—that's the one that's being invaded—and the one I was just in, the one that's doing the invading, that's Paratime Gamma."

"Go ahead."

"Paratime Gamma didn't invent the portal. We did in Alpha."

"Who's 'we,' hon? Did you invent it?"

"Nobody invents that kind of thing by himself, not things as complicated as the portal—it's like asking who invented the atomic bomb. I was part of the team, but I was only an apres-doc when I came on. The ones who made the theoretical breakthrough were Hawking and Gribbin in England, and in the United States Dr. DeSota. Got that part straight?"

He wasn't really being sarcastic, just trying to make sure she understood, but off in his corner Moe made a sort of warning growl in his throat. Nyla shook her head without looking at the goon. "Go on," she said, and this time there was no "hon."

He said obediently, "At first all we could do was peep. That means, we could look through the barrier—we could detect radiation, you see; and after a while we began to get real vision. Not for all the paratimes. Some are accessible, most aren't. Dr. DeSota says it's because of resonance effects—we're 'out of tune' with most of the lines. Actually, there is an infinite number of them, of course. When I—uh—when I left, there were about two hundred and fifty that had been mapped, but for most of them we could detect nothing more than a kind of smeary blur. Is this what you want to know?"

"What we want to know, sweetie," said Nyla, "is everything. If you could just peep, how come you're here?"

"No, no," he said, patiently enough, "that was just at first. That was when I joined, along about the beginning of August, 1980. In October we were able to send objects through without retrieving them. And by January, 1981, we sent a person through. Me." He added ruefully, "I volunteered."

"And how do you do that?" asked Nyla.

He said, still patient—barely patient, "There is not any person in this room who would have the faintest idea what I was talking about if I told you."

Nyla was keeping very good control

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of herself, but if I had been Douglas-Alpha I would have watched myself pretty closely. She said shortly. "Try."

Douglas must not have liked the look he saw on her face, because he swallowed and hurried on. "I don't mean you wouldn't understand because you're stupid. I mean there are only two ways to describe it. One is with the words we had to coin as we went along---the portal device generates a stream of green-dip chronons which heterodynes against the natural flux of red-flow chronons. Do you see what I mean? Gibberish, right? And the other way is mathematical and, please, you'd need to know at least basic quantum mechanics to have a hope of following it."

I saw what he meant. So did Nyla, but all she said was, "Tell us what the dates were."

He shrugged. "Dr. DeSota's doctoral dissertation was, I guess, the first rigorous proof that there were quantum effects of the kind Schroedinger proposed. That was about 1977. It's what made me go back for my doctorate. Then he and Elbert Gillespie detected the actual chronons in 1979, and developed the peeper a few months later. Then, like I said, I went through to Gamma."

He stopped, waiting. Nyla was thinking. "So you defected," she said.

"I helped them," he corrected. "I didn't have any choice, did I?"

"And you could help us," she smiled, all sex and sunshine again.

"Now, wait a minute!" he objected. "I— Maybe I could try, but— Look at that tape-recorder! If that's the best you can do, you don't even have solid-state technology. I need something to build on, you know!"

She said gently, "How about building on the entire resources of the United States government?" And when he frowned, "You did it for the—what do you call them? The Gamma people—"

"But they threatened to beat the hell out of me—"

He stopped short, gazing at her.

She smiled. She waited a moment to let it sink in. Then she did something I would not have expected. She got up, still smiling, walked over to him and sat on the arm of his chair, her hand on his far shoulder, her body pressed against his head. If I had suspected she wore nothing under the blouse before, now I was sure of it. She toyed with his ear. "We don't threaten," she said silkily. Another pause, while Douglas glared around the room: trapped animal being offered bait. "On the other hand," she went on, her voice softer and huskier, "we do reward. Oh, yes, hon, we reward. I would personally reward you every way I could."

I could almost smell the pheromones steaming out of her.

So could the local Larry Douglas. "Bitch," he whispered, so softly that I could barely hear him, though he was right next to me on the edge of the bed. "You know what she's up to? She's ambitious, old Nyla is. She's going to use this to get right out of the F.B.I., right up to the top. And when she gets that poor son of a bitch in bed, he'll do anything she wants—believe me, I know!"

He stopped, because Moe was glowering at us.

He hadn't stopped in time. I swal-

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lowed, and my saliva had a sudden, bitter taste of rage. How crazy that was! I was *jealous!* I was jealous of the little rat sitting next to me, so hotly jealous I could barely keep my hands off him, and for what? Because he had bedded this other Nyla!

Crazy.

It was worse than crazy. I knew it. I didn't care. If I could have pushed a button and exterminated the bastard I would have done it in a hot minute. Not just him. The one she was whispering to across the room, too—especially him! Not just even him. I was willing to extend my detestation to all Larry Douglases, or even look-alikes, like my old acquaintance and drinking buddy, His Excellency The Soviet Ambassador The Honorable Lavrenti Yosifovitch Djugashvili.

It is a constant wonder to me how crazy a sane person can get.

I was so filled with rage and jealousy inside my own head that I hardly noticed when Nyla sat straight, scowling. She glared at the window. "Moe," she ordered, "close the damn blinds! I don't want the whole world gaping in here!"

"Chief," he protested, "nobody's looking in—"

"Close them!" And she turned back, all smiles again, to the man who was obviously responding to whatever it was she had been whispering.

And I was on fire.

It was obsessive. I wanted to possess that woman, right then, and I was willing to kill anybody who challenged me for her. I was paying so little attention to anything else that I hardly noticed the faint *thwick* sound that came from nowhere, was distracted only on the surface of my mind when Moe, turning away from the window, seemed to trip and fall forward, crashing into the tape recorder. I did not fully come back to reality until Nyla herself jumped up, face suddenly full of shock and anger, opening her mouth to yell—

There was another *thwick*.

Nyla, too, fell like a brain-shot deer. I could see a tiny feathered dart gleaming out of the thin fabric over one shoulder.

We looked at each other in amazement. And then all questions were answered for me as there was a quick puff of air-pressure, like a door slamming closed on a tight, tiny room, and there, grinning at me, was me. That other me who wore the funny coveralls. "Hello again," he said, nodding. "Here, give me a hand, let's get her out of the way."

The Douglases were quicker at following orders than I; they jumped, however bewildered, and among the lot of them tugged the sleeping woman out of the middle of the floor. Just in time. Another quick, silent pulse of pressure, and a tall, cylindrical metal object appeared on the floor. "Just keep quiet, please," the new Dominic ordered. He pulled open a panel on the cylinder, fussed with what was inside and looked up, waiting.

A shimmering oval of blackness spread itself before us.

"Looks like it's working," he said, and shrugged. He was smiling. I found myself smiling back—whoever he was, whatever he represented, it was not likely to be worse than what I had here. He glanced around the room. "We'd better not hang around," he said, "but I think we ought to take these two along

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with us. Let's get the woman through first."

By then I was functioning well enough to help, though it was no great effort for four of us to lift Nyla's sleeping form through the black oval. It was, however, truly eerie—not just to watch her disappear, inch by inch, but to feel unseen hands on the other side catch her and pull her through.

The apeman was a lot harder. But there were four of us, not counting the help on the other side. "Now all of you," ordered the Dominic-in-charge. We obliged—the wimpy Dominic wonderingly, the ratty Douglas resentfully, the snakebitten Douglas fearfully—and me fairly fearfully, too, as I followed them.

Hot dark night, except for floodlights. I came out on a rough platform of wood, with two men in civilian clothes grabbing my arms. "Just move away, please," one of them said, eyes on the spot I'd come from.

In a moment the black cylinder appeared.

In another moment Dr. Dominic DeSota of Paratime Alpha popped into sight. "Got it all," he crowed, looking delighted with himself. "You fellows, welcome to Paratime Alpha—and you, Doug," turning to the fearful one, "welcome home."

But Doug-Alpha did not look in the least joyful about it.

Out in the northwest suburbs a householder finished his second cup of coffee, stretched, found his White Sox cap to keep the sun out of his eyes and put it on. Vacation time was the time to get caught up on the chores around the house, and the back lawn needed mowing. As soon as he opened the sliding door to the patio he stopped short, marveling. "Marcia," he called, "come look! We've got hummingbirds in the marigolds! We never had hummingbirds before!" And he watched his wife's face as she came up to see, first the polite curiosity, then the smile of pleasure . . . then the other expression that followed and wiped the smile away. He could not understand the sudden shock on her face, until he turned and saw what was eating the hummingbirds.

27 August 1983

12:30 A.M. Major DeSOTA, Dominic P.

You can't see much out of the windows of an Army transport jet, but as we banked steeply somewhere over the Capitol I could see the whole District spread out under us. It didn't look warlike. They had the floodlights on the White House and the Lincoln Memorial, and there were long lines of car headlights and taillights because everybody in Washington was out to celebrate T.G.I.F. night. . . . No! Right along the Potomac there were only a few lights on the roads, and they didn't look like the usual car traffic. Some were single bright spotlights. Some were the faint glow that comes from the slitted headlamps of military vehicles. I leaned across the aisle to the dozing Infantry colonel and tapped his shoulder. "If those are what I think they are," I yelled, "won't the Russian satellites spot them?"

He peered past me to see what I was talking about. "Oh, yeah," he grinned.

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"They're practicing for the Labor Day parade. What did you think?"

"*Labor* Day?" I gaped at him, but he'd unfastened his seat belt to come next to me, leaning to the window.

"Could you see my battalion on the White House grounds?" he asked, disappointed because we were looking the wrong way. I shook my head. "That's crowd control for the parade," he announced, winking.

"Jesus! Labor Day's not for ten days yet. Do you think the Russians are dumb enough to buy that?"

He shrugged. "If they weren't dumb they wouldn't be Russians," he offered, and buckled in because the steward sergeant was coming down the aisle to frown at him.

But apart from that one little patch, there was the same old District, all peaceful and busy and happy. All the other roads were the way they ought to be. Even from the air you could see clearly that these people were not worried about any invasions. . . .

And on the other side of the barrier, I knew, there was another Washington, where our first assault wave had gone through and taken all the Potomac bridges.

And what the people in *that* Washington were doing that Friday night I could not imagine.

When we got out at Bolling and showed our orders the Transportation clerk offered to get the colonel a staff car, provided he'd drop me off on his way to the White House. It was a good deal for both of us. On the drive in, the colonel did everything but bounce around in his seat with anticipation and joy. He had already let me know he was a West Pointer, and I'd seen the Chile and Thailand ribbons on his chest. "This will be the biggest yet," he promised. "You'll get your silver leaf out of it, Major, so cheer up! You don't get promotions for being in a secure zone when an invasion's going on!"

"Yeah," I said, gazing out at the Virginia countryside. What he said was true enough. What he didn't know was that General Ratface was not going to forget me. He couldn't court-martial me after giving me a medal two hours earlier. But he would remember. Some day, sooner or later, I would be caught hoisting a beer in the Officer's Club or spitting on some GI sidewalk, and then the general would sink his teeth into my throat for the kill.

Unless, of course, I picked up a few more medals in this operation. I'm a prudent man. But it looked to me as though the most prudent thing I could do now was to be a hero, first chance I got. . . .

We crossed the bridge right under Arlington Cemetery, with the Eternal Light flickering on the hillside behind us. Traffic was heavy and civilian, though I knew that right here, on this very structure, our troops were holding the enemy off, just a wrinkle in time away. And ahead of us—

"What the hell is that?" I asked, pointing to what looked like million-candlepower searchlights blinking into the sky.

"Must be time for the Russian satellites to come over," said the colonel. "Those strobes are on top of the White House and the Sheraton Command Center, and if the Russians can make out

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any details with their optics fried they're welcome to them. Anyway," he added, grinning again, "they're just more practice for the Labor Day firewords celebration." He dropped me at the driveway to the Sheraton hotel, commandeered for an operations headquarters. When I showed my orders I found out the front door was for full colonels and up only; people like me had to go around to the ballroom entrance, through the parking lots. And the lots were full. Not with the usual tourists' cars and VIP's limousines; there was at least a division's worth of tanks and personnel carriers parked in orderly ranks—and with a few not very orderly at all vehicles that had been pulled back from the first assault. Some of them had taken heavy fire. One or two were a real surprise, because I couldn't see how they'd got back at all—a turret blown off one medium-heavy, a weapons carrier that seemed to have burned, four or five other vehicles with holes in them that hadn't come from moths. They were all under tarpaulins to keep the orbiting Russian eyes away, and armed guards patrolled that part of the area.

And just beyond the fringe of boxwood hedge were the busy streets of the District, where a million people were buzzing along without a care in the world.

Whatever was happening in the lobbies and bars and restaurants of the hotel, people like me were not likely to find out. Our part of the hotel was the meeting rooms, and they were as close to GI as they could be made. I got a badge to hang on my blouse in exchange for a copy of my orders, and was sent to the William McKinley room for disposal. On the way I passed a ballroom that was full. It was neither a wedding nor a bar mitzvah; what it was full of was troops, mostly in their underwear, changing from the uniforms of their side in which they had been captured to the uniforms of ours in which they would be discreetly transported to the stockades in the Maryland hills.

Prisoners.

I paused, rubbernecking. These weren't the Air Force guards we'd captured at Sandia. There were combat soldiers, and the wounded among them proved it with their dressings. The difference between their uniforms and ours were multiple, but not all that conspicuous at first glance. The basic color of the uniform was the same olive-drab for both. Their chevrons were smaller than ours, and silver-edged where ours were all black. Ribbons were something else—I couldn't see them clearly enough to tell much, and the MP captain in charge of their guards was beginning to give me hostile looks. Besides, my orders had been to report to the William McKinley room at once, and who knew if the door guards had phoned ahead?

If they had, it made no difference. The tech sergeant at the table by the door had never heard of me. She pawed through papers, muttered into a phone, turned the papers upside down and pored over the back of them and finally said, "Take a seat, Major. We'll get to you as soon as possible."

I didn't have any trouble translating that. "As soon as possible" meant "when we find out who you are and what you're supposed to be doing here." I resigned myself to spending the next

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considerable fraction of my life on one of the gilt-backed banquet chairs lined along the wall.

It wasn't quite that bad. There were anywhere from fifty to a hundred people going in and out of that room. Hardly any of them paid any attention to me. But it was no more than twenty minutes, and I'd only had my feet stepped on twice as people in a hurry crowded past, when the sergeant came back. "This way, Major," she said.

Lieutanant Kauffmann was not only ready for me; he said, first thing out of his mouth, "Where the hell have you been, Major? You're supposed to be over at the White House right now."

"The White—" I began, but he cut me off.

"Right, and you're supposed to be in civilian clothes, too. It says here—" he speared a folder out of the stack on his desk— "that you closely resemble a U.S. Senator on the other side—"

"Resemble him, hell. I am him."

He shrugged. "Anyway, you're going to assume his identity. After the first wave have secured the White House—"

It was my turn to cut him off. "We're invading the White House?"

"Where've you been?" he groaned again, this time with a different intonation. "They haven't responded to our messages; now we try force. You'll go in civilian clothes, as I said, and take two guards in their uniforms with you. You'll get orders from the portal-master, but it looks like they want you to find the President, take her prisoner and bring her back here."

"Holy shit," I said, and then, "Wait a minute. What if the real Senator DeSota is there?"

"He's not," he said positively. "Didn't you capture him yourself?"

"But he got— I mean, I thought he'd returned to his own time."

Shrug. Translation: *Not my department.* "So," he went on, "get your B-4 bag and change into civvies, and we'll get you transportation to—"

"I didn't bring any baggage," I said. "I don't have any civilian clothes with me."

Thunderstruck stare. "You *what?* Christ, Major! How the hell am I supposed to get you fitted out with civvies? Where would I get them? Why the hell—" And then he turned to the sergeant. He had remembered how to get difficult tasks done. "Sergeant! Get this man fitted out with civvies!"

And so it came to pass that twenty minutes later the sergeant and I were getting out of a commandeered Cadillac limousine the size of a house trailer, in front of a store whose neon said *Formal Clothes Rental for All Occasions.* The neon was turned off, but the owner had opened up for us. And forty minutes after that we were on our way to the White House, and behind us the proprietor was grumpily closing his store again. "Good work, Sergeant," I said, stretching out in the back seat, which was roughly the size of a football field. I admired the gleam on the rented patent-leather shoes, smoothed down the rented satin cummerbund, adjusted the rented black bow-tie. I was, I believed, the very picture of a U.S. Senator coming from some formal dinner party for a late-night call on his President. "I guess the tux is the best idea," I observed, "because who knows what the

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current styles for men are in their time? And formal clothes don't change, do they?"

She said shortly, "We hope." Then we were at the VIP gate, and she was showing documents to the very thorough and skeptical MP, with two other MPs right behind him, looking over his shoulder. They were all armed, but they didn't have to be. Beyond them, square in the middle of the narrow drive, was a personnel carrier with a heavy machine gun mounted in the rear, and it was pointed right at us.

It took me a moment to realize that the White House had changed considerably. The strobes! They weren't there—evidently the Russian satellite had passed and they were no longer needed. That wasn't the only thing.

Even Washington Friday-night people go to bed sometime, and the traffic had been dwindling all along. Not here, though. The traffic jam was all around us, parked on the grass, crushing the roses. The lawn of our White House would be five years recovering from the tanks and half-tracks and personnel carriers that had chewed it up—"rehearsing for the parade," of course.

I could see why they were not letting ordinary civilians in.

I was no ordinary civilian, though. We were waved through at last. The weapons carrier started up and pulled off onto the grass to let us through—another hundred dollars worth of turf down the tube—and our driver took us to a small portico I had never seen before. "Good luck," said the sergeant—hesitated, then leaned forward and gave me a kiss to show she meant it.

That was the last time for quite a while that anybody showed any affection for me.

The only other time I had been in the White House was in Stevenson's second term, and it was nothing like this. Now there weren't any uniformed pages to show me around, no velvet ropes to keep the barbarians out of the sacred chambers. There weren't any sacred chambers. There were troops in half the rooms, and machinery or weapons in most of the others. A corporal took me swiftly down a service hall and up a broad staircase, not encouraging pauses or gawking. I wound up in a green-draped room with portraits of the Presidents Madison and Taft on the wall. It was a strikingly handsome room, not counting the urn of coffee with paper cups that stood on a card table near the door. The upholstered chairs were sparsely occupied—four or five civilians, one of them a woman who looked familiar—so did two of the men, especially the black one I recognized as a former heavyweight prize-fighter—and eight or nine soldiers in the dress uniform of the other side, with side-arms that looked as though they meant it.

Two of the soldiers got up and came toward me, hulking, huge paratroop types, both with corporal's stripes. "Here's Major DeSota, sir," said my own corporal, saluted, and left.

It is a measure of how fast things were happening that it did not occur to me that corporals did not salute corporals. I said to the bigger of the two, "The first thing I'd like is some of that coffee, corporal."

He raised an eyebrow as thick as a chevron, then grinned. "Let's get the

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man some coffee, Captain Bagget," he said; and while corporal number two went over to pour me a cup, corporal number one said, "I'm Colonel Frankenhurst, Major. Do you know your mission?"

It took me a minute to reorient. "Sorry, sir," I apologized. "Uh—only in general terms. I mean, I understand I'm supposed to find this President Reagan, and when I do you two are supposed to take her prisoner and bring her back."

"Shit," he said dispassionately. "Well, it doesn't matter. The major and I have been rehearsing this for the past forty-eight hours. If we're stopped I'll do the talking; all you have to do is look like a senator. Can you handle that?" Then he grinned, to show that he had the situation well in hand. "Don't worry about it, Major. First place, we may never go through. They're having trouble with the peepers; these people on the other side move around so fast they can't keep track of them. Last I heard, they weren't going to open a portal before oh-three-hundred anyway."

"That's dumb," observed the captain-corporal, returning with my coffee. "They ought to wait till morning, that way we won't look so conspicuous." The colonel only shrugged. "Of course," sighed the captain, looking me up and down, "a tuxedo won't look exactly *normal* at eight o'clock in the morning, either."

"Six of one, half a dozen of the other," said the colonel. "Well, DeSota, would you like to meet the other doubles? This is Nancy Davis—of course you've seen her on the TV." Of course I had; she was the star of the *I Remember Mama* remake, and how they'd got her away from her studios and her well-advertised activities raising funds for everything from Animal Welfare to the Right to Life I couldn't guess. "She's the President," Colonel Frankenhurst grinned. "John here is a Washington police captain on special White House duty—in the real world he's an airline pilot from Ohio. And the Champ is a Senator like you." He watched me shake hands. "Pretty good work getting you all together," he said complacently. "We missed a few, of course. We found the President's personal maid, but she was eight months pregnant—they didn't think anybody would be fooled. And we lucked onto General Porteco, her personal military aide. Unfortunately our guy was just coming out of the DTs and they couldn't trust him to remember his lines."

The other civilian came forward. "I'm not anybody's double," he apologized. "I'm Professor Greenberg —political science—they called me in to try to get a line on what the structure of this other society is like, so I've been interviewing you doubles to see if I can figure out where the differences began. But before I get to you, Major—you've been through once already, haven't you? What's it like?"

So for the next half-hour I did the talking. I didn't have that much to tell, after all—what did I know about the other side except for about a quarter of a square mile in the New Mexico desert? But it was more than anyone else present knew, and they all had questions. Professor Greenberg wanted to know how much a Coke cost out of their machines.

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"Senator" Clay wanted to know how many of their troops were black. "President" Nancy Davis wanted to know what the hit TV shows were, and whether I knew if abortion was legal. Colonel-Corporal Frankenhurst wanted, very badly, to know how well those other guys had done in hand-to-hand combat, if any had occurred when we took over their Sandia base.

I did my best. But while I was still trying to remember who the hosts on those other guy's Today Show were for Nancy Davis there was noise in the corridor, and the door flung open and in came President Brown and entourage. He didn't look happy.

I hadn't expected him to, because I'd already heard how pissed he was at the disruption of his home life with troops and equipment, not to mention the disruption of his schedule because he had had to cancel every appointment with every person who wasn't cleared to know what was going on . . . which was almost everybody. "There you are," he snapped to sweet-faced, bland-smiling Nancy Davis. "I've got to talk to you, right now!"

She wasn't fazed in the least. Affably, "Certainly, Mr. President. What can I do for you?"

"You can tell me what the hell kind of person you are," he snarled. "You don't respond to my public messages at all! What does it take to get you to act?"

"I guess you mean that other me, Mr. President," she smiled. She really had a dimple when she wanted it—a triumph, I was sure, of the cosmetic surgeon's art. "I don't know if I can tell you that. After all, I'm not really the President —here."

"Make believe you are, for God's sake!" he roared. "Do you have any idea what's resting on this? I'm not talking about this cockamamie other world, I'm talking about *here*. The Russians are getting really nasty about the 'parade preparations' and the 'archeological study site' in New Mexico, and there are too many people involved. It's only a question of time till the word gets out, and what are they going to do then?" As she opened her mouth he said, "No, that's not what I'm asking you—what the hell would you know about that? I'm asking you about *you*. The other you. Would it help, do you think, if I cancelled this operation and tried to get you, the other you, on the phone? President-to-President? A one-on-one talk?"

"Why, I think that would depend on what you said, Mr. President," she said thoughtfully.

"I'd say the truth!" he barked. "Might be an interesting change, at that."

"Well," she said slowly, "I rather think, Mr. President, that I'd remember my oath of office. I suppose it's the same one you took. To defend the United States against all enemies, domestic or external—even if they're both domestic *and* external, so to speak. What I would not do, I think, is allow my country to be invaded by anybody at all without fighting back with everything I had—even if the invaders were my own country."

He glared at her, baffled. Then he glared around the room, particularly at the uniformed men. I think that was the only time in my life when I was glad I was a lowly field-grade officer, with no responsibility for high-level planning. I would not have liked to be on

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the Combined Chiefs of Staff right at that moment.

Then he sank slowly into a chair, gazing into space. One of his flunkies whispered urgently in his ear, but the President shook him off. "So we've got a war on our hands after all," he said.

No one responded to that.

There was a lot of silence in the room. The anxious flunky glanced at his wristwatch, then at Jerry Brown. Without looking at him, the President said, "I know. It's probably academic by now. Take a look out the window and see if it's started."

The aide was a youngish man, no more than thirty-five, but he looked more like a hundred as he moved stiffly toward the long green drapes.

He didn't have to, actually, because by then we could all hear the racket of truck motors and tank diesels starting up.

Then everybody was at the windows. There were three of them, and instinctively we left the one in the middle for the President's solitary use. He made his way slowly over and stood gazing thoughtfully and silently at the hot August night outside, while all the rest of us crowded around the other two.

What we were looking at was the South Lawn, usually reserved for photo-opportunities with visiting heads of state or Easter egg hunts by the Washington children. Someone had built a huge flimsy tarpaulin structure to shield something from eyes in the street or overhead, but from our window we could see what it contained: the huge black rectangle of a portal, like a movie screen before the picture has started to show, only black. Even though I'd done it before, it was unnerving to look at that thing and imagine plunging into it.

It was even more unnerving when the first squadron of six whippet tanks roared through and disappeared, churning up the already battered grass . . . after them a dozen personnel carriers with combat-ready machine-gunners and Rangers . . . after them a company of paratroops in camouflage suits on foot. . . .

The President sighed and turned away. He walked out of the room, his ducklings waddling after, into the corridors that were also beginning to get noisy with the inside part of the operation. And the ones of us still left in the room looked at each other.

Because we knew that we were likely to be next.

It all went pretty briskly after that—as you might expect, because it was all downhill. People were rushing around, flinging orders in all directions; the sparks flew. I felt the tingle. I worked myself up to a fair-to-middling case of jitters, mostly over the question of how I was going to find something so heroic to do that it would placate even old General Ratface Magruder. Then they hustled us out of the Green Room, up a stair, down a hall, past guards with rapid-fire weapons at the ready . . . and there we were. In the Oval Office itself. Occupying the very seat of majesty.

It didn't look the way any seat of majesty was supposed to look. It looked like moving day, with a little bit of mad-scientist laboratory for dessert. The big presidential desk had been shoved against a wall. Thousand-dollar armchairs and five-thousand-dollar couches had been

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stacked against another. And in the center of the room a rectangle of copper tubing surrounded nothing, like an empty picture frame. It filled the center of the room floor to ceiling, with the squat boxes of the portal field generator on one side of it and the control panels on the other.

The field was down.

Nothing was happening but yelling and confusion, because that scary, velvety black nothing did not fill the rectangle. You could see right through it, and what I saw was a full bird colonel whimpering with rage and frustration, while his technicians ripped the panels apart, trying to find the blown fuse that had crashed the portal. Three-quarters of a platoon of assault troops stood glowering before the panel, while their captain helped things along by yelling at the back of the colonel's head. A captain should not talk to a colonel like that. The colonel was too deep in misery to hear it.

It was not a peaceful scene.

The portal-master came toward us. She was a major. She wasn't yelling at anyone. Her face showed no expression at all but terminal weariness. She told my corporals, "You're on hold. We only got eight men through before it crashed, and you might be scrubbed. Stay out of the way."

Colonel-corporal Frankenhurst gave us a jerk of the head, meaning *do it*, but tarried to ask, "How's it going on the other side?"

We tarried to hear. Needlessly. It was a dumb question. The portal-master didn't try to answer it. She just turned and plodded away; because, of course, she didn't know. She couldn't. Once the troops were through that portal they were gone. They could not be seen or heard. They could not come back to report. They could not even get a message through until a portal generator was through and operational on the other side. If we had had a peeper working . . . but in this rig the peeper field was tied to the portal itself, and neither was working. We didn't know a thing. . . .

And then we did, and it was bad. The operation was a tactical surprise, a complete success in every way but one. We hadn't done what it was set up for. Madame President had been hustled away through an exit no one had mapped.

Within ten minutes two-way traffic was established on all floors, but by then it didn't matter any more. We took prisoners by the score. We had flushed guards and Secret Servicemen out of every butler's pantry and clothes closet. I saw President Reagan's own military attache, a brigadier general in full-dress uniform, wearing an expression of fury and resentment—why was it *me?* We even had the First Gentleman, caught going back for the videocassettes of his old films, but we didn't have the one we wanted.

Madame President had got clean away.

In the first hot dawn light I hitched a ride back to the Sheraton in a White House van, incongruous among the prisoners and guards in my rented tux.

We were going to have to fight for it.

The tear in the screen was tiny. All it let through at first was air, tanged with the viny smell of tomatos and the sweet, grassy odor of growing corn. They were

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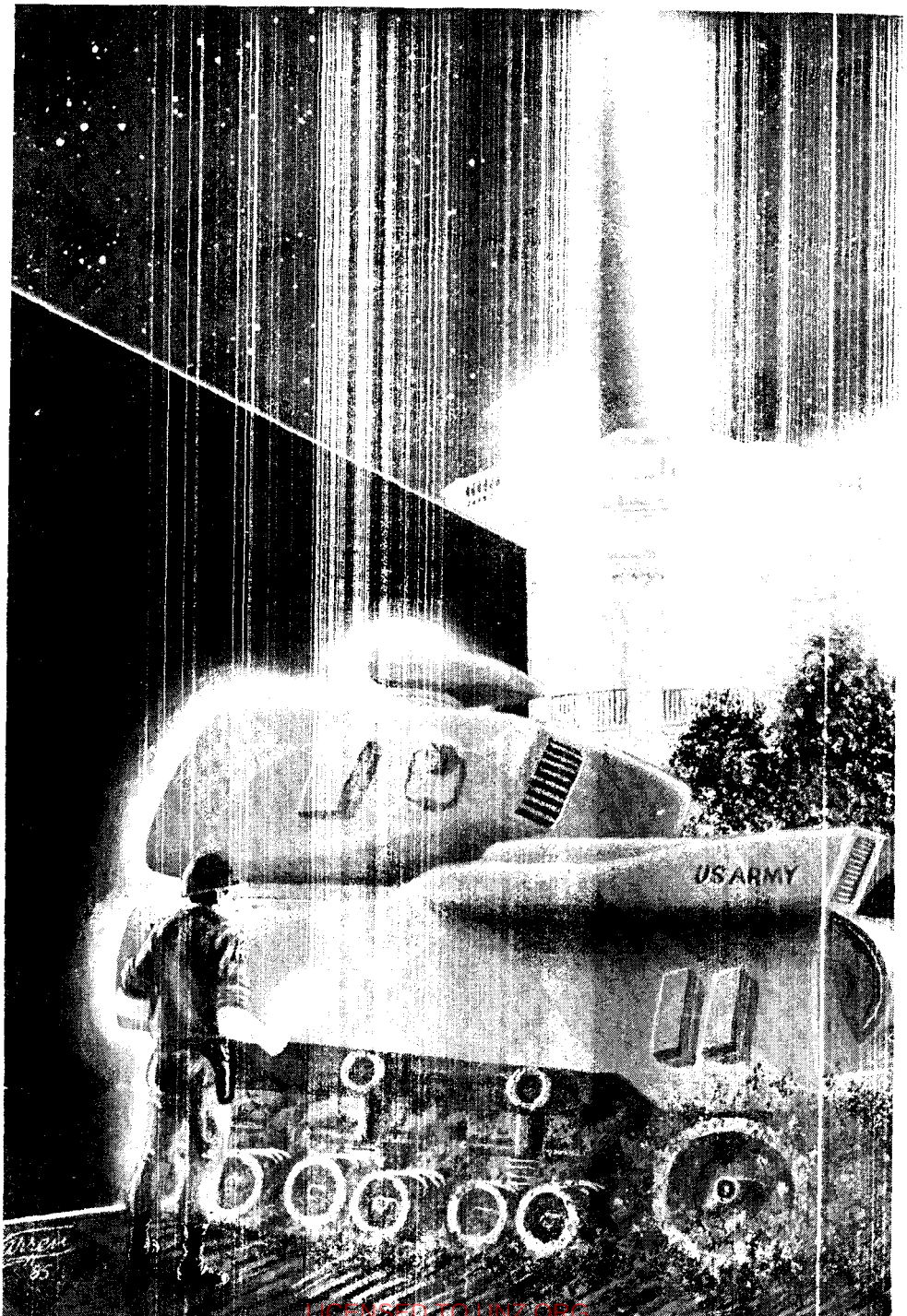

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noticed only as curiosities, in the huge sprawl of Levitt-Chicago, where no crops had grown for twenty years. Then a bird drifted through, unnoticed. It fluttered around, looking unsuccessfully for its nestlings. It never found them. Birdlike, it went about its business of eating and excreting. It made no change in the world at all . . . except that, back in its own time, it had eaten seeds from the kudzu vines. When it dropped them in an ungardened patch of weeds they grew; and for a century afterward that whole section of Illinois was plagued with the sturdy, migrating, unconquerable invasion of kudzu.

27 August 1983
0940 Dr. Dominic DeSota-Arbenz

As soon as the pulseur was airborne and the seat-belt sign went off I was up and running. There was a woman in a purple muumuu who slipped into the aisle just ahead of me, with a quick flick of a triumphant look over her shoulder. But that was all right; she was only heading for the w.c. I was first in line for the phone.

Actually I got there too fast. When I dialed home I got a busy signal, because we weren't at cruising height yet and the pilot hadn't relinquished his disposable radio channels. I kept dialing. I was impatient. I'd been away too long. The first time I went through to another time my wife had kept me awake all the night before with worries—she remembered all too well what had happened to Larry Douglas. But that was physically near to us, at least —Sklodowska-Curie was less than six kilometers from my front door, and that first trip, going to Rho-time, I'd just popped in and popped out again, mostly to test the new suit.

I make it sound easier than it was. I was scared, too. But when we began narrowing down our searches to the times that were actually getting somewhere with paratime research, or at least theoretical quark physics, the area of exploration began to increase geographically, too. Beta had a facility just south of San Francisco. Phi had one in Red Bank, New Jersey. It was pop through a portal, pop out, jump on a pulseur, fly a few hours, pop through another portal . . . and I had a wife and child I really would have liked to see.

The third time I dialed my number I heard the beepers putting me through, and Dorothy was home. She picked up the phone on the first ring. I was never gladder of anything than to see her sweet, calm face peering out at me from the phone.

"You're looking real good, Do," I told her. She inspected my picture at the other end. Because the camera lens on our home phone is over the screen she had a sort of unfocused look, as though she'd forgotten her glasses, but she saw sharply enough.

"I wish I could say the same for you, hon," she said. "Is it going badly?"

I couldn't tell her just how badly over an open phone, but she didn't have to be told. She could see my face. I said, "Middling awful. How's Barney?"

"Missing his daddy, otherwise all right. He cut a tooth." I'd caught her with a cup of coffee in her hand, and she took a sip, looking at me. "It's not just that there's that, uh, problem," she decided. "There's something else on your mind. What is it, Dominic?"

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I said, surprised, "You're right, Do. I feel—funny. I don't know why."

She nodded. I was only confirming what she knew. When Dorothy Arbenz came to the Institute as an apres-doc psychologist I saw at once that she was beautiful, quickly learned that she was very understanding. It only occurred to me later that for the rest of my life she would be reading my mind, or next thing to it, but I married her anyway. She left my subconscious to worry about what I was worrying about and changed the subject. "Are you coming home now?"

"I wish. It isn't a Sklodowska matter any more, hon."

"You're going to Washington?"

"'Fraid so."

She took a deeper swallow of coffee. I'd begun to be able to read Dorothy's mind a little, too, so I knew what was coming next. "Are you going through again?" she asked.

I didn't answer directly. "It isn't up to me any more," I reminded her. She knew it wasn't an answer, and she knew, as well as I did, that if I went through again it wouldn't likely be just a little prowl around to see what was going on.

So I blew her a kiss, and she blew me one back, and after I'd hung up I sat before the phone for a moment, thinking about what it was that was worrying me.

I knew what it was. I'd known it at once, I just hadn't wanted to think about it.

There were too many me's.

When I was skulking around Tau and Epsilon I'd seen other Dominic DeSotas, but it wasn't until we had three of us in the same room that the wonder—the grisly, spine-twitching astonishment and dread—really reached me. I mean, they were *me*. Not the one me I'd lived with all my life, but the me's who I might have been—who, in their times, I *was*. I could have been born into a time when science was a dirty word, and wound up a thirty-five-year-old juvenile, furtively sneaking embraces with a *coeur-douce* I couldn't afford to marry, terrorized by my own government, whipped into line by an oppressive social system that made me ashamed of my own nudity. I could, in fact, have been the Nicky DeSota the back of whose head I could see, a dozen rows ahead, and in some sense I was he. Or I could have given up science for politics and turned out a United States Senator. Well, that wasn't awful. It was a pretty good life—wealth, power, the esteem of all who knew me—but there was a sleaziness to it, too. There he was, or I was, sneaking into a hole-and-corner adulterous relationship with another woman, because I had a wife I no longer loved and could not rid myself of without terrible heartbreak and recriminations, not to speak of financial and political ruin.

Or I could have taken the military road, like my other avatar the Major, who prided himself on deception and brute-force conquest . . . or I could have died early, for one reason or another, as seemed to have happened to the Dominic DeSota in Rho.

And all those me's were me.

It was scary. It threatened the stability of my life in ways I had never felt before. Everybody always knew that things could have been very different for him

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somehow . . . but it was a whole other thing to know that, somewhere, they *had* been.

I gazed out at the two of them. Even from a dozen rows back I could see that Nicky was having the time of his life in the big widebody, half empty with the light Saturday traffic of the week before Labor Day. So was the Senator. I admired them for taking so much joy in what was around them, in spite of the fact that they were both, as far as they knew, marooned in a time as alien to their own as Mars . . . of course, I hadn't come from where they had just come from.

The other thing I could see was that the executive type in 32-C, the one who had already begun spreading out the contents of his attache case onto his tray, the empty seat beside him, and its tray, was casting irritable glances at the phone.

I turned back and made my other call.

I didn't go through the switchboard at the Sklodowska-Curie Institute. I dialed Harry Rosenthal's private line, and, as expected, when I got him on the phone the wall behind his face was not the one in Chicago; call-forwarding had tracked him to where he was. "You're in Washington," I said.

"Damn right," he fretted. "Waiting for you. Getting calls every five minutes from the Army and the Science Secretary and the CIA. I wish you were here now, Dom!"

I didn't ask why.

My conversation with Dorothy hadn't been exactly joyous. Neither was this one. I started out with two big worries—the invasion of Epsilon by Gamma, and ballistic recoil. The call didn't ease either of them. It made them worse. "The events we were monitoring," Harry said tersely, "are still proceeding. And as to the other thing—have you seen the TV news?"

"How the devil would I get time to watch television, Harry?"

"You might want to make time," he said gloomily. "There are intrusions popping up all over the place—we can't get instrumentation around fast enough to check them all. But when you get a thunderstorm on three tables of a Sunday-school picnic and clear skies everywhere else, you don't need instrumentation to know what's happening." Then he added a new worry. "The Secretary wants to know why you brought those Tau people back."

"But Douglas spilled his guts to them," I protested. "That's policy! You set it yourself—limit knowledge, keep the ones who don't have it from getting it."

He stared at my picture. "You were sent to bring Douglas back, and to rescue one involuntary emigré, the Senator. Nobody told you to manufacture four new emigrés. What are you going to do with them now?"

Since I didn't have an answer to that, I was glad to hang up and let the executive type have his turn at the phone.

I made my way back up the aisle to the midships stew coop. On the way I passed the two other Dominics, both of whom wanted to talk. I didn't. I gave a friendly wave to each and kept right on going. They would have to wait. I had to think about what Harry Rosenthal had asked me.

The stews were busily pulling bubbles of scrambled eggs out of the mi-

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crowave, but when I said, "Steerage, please," they didn't argue. They knew what they had in steerage. One of them broke off long enough to put me on the little elevator, and it carried me down to the X-class passenger compartment below.

Airlines use the below-deck passenger space in the widebodies for all kinds of purposes. Some put first-class bars there. One or two filled them with seats they sold at a cut rate—there wasn't any easy way of getting out of them if there was trouble, and so they weren't exactly popular with most travelers. Trans-Continental used them for couchettes-dormir on long flights, and sometimes for special purposes on shorter ones.

We were a very special purpose.

We were even more special than what they ordinarily euphemistically meant by a "special purpose," which is to say for transporting prisoners. There weren't any prisoners here, exactly. There were the two F.B.I. people from Tau and their Larry Douglas, who had committed no crimes anybody in our world cared much about. Then there was our own Larry Douglas. Whose status was pretty murky; whose trial, if he ever had one, would set about a million precedents—I'd already heard the lawyers arguing about what "jurisdiction" meant in this case. No prisoners. The *flic-denation* who was sitting by himself, reading an in-flight magazine, wasn't a guard. Just a precaution.

I came in from the front of the compartment. There was room for thirty people in it, and our lot didn't crowd it at all. The F.B.I. woman and her anthropoid were sitting at the far end of one row, whispering to each other. More accurately, the woman was whispering and the bruiser was listening humbly and respectfully. Neither of them looked up. Their Larry Douglas was across the aisle, wistfully trying to get invited into the conversation. They weren't interested. And our own Larry was sitting with his head down in the first row, imaging hopelessness. He didn't look up either, but I knew he had seen me come out of the elevator.

I looked at him for a moment. What a lot of hell this man had unleashed! When we found out for sure what he was doing—when the people he was working for made the quantum leap from talk to deployment—we had to decide what to do about him.

I voted for going after him. It was a close decision. My first impulse was to send him some token of our esteem, like a pack of rabid wolves. Though I didn't say it, it seemed still like an attractive idea.

Though I hadn't said it, he lifted his head and whined, "I couldn't help it, Dom! They were going to torture me!"

I was surprised to hear a contralto laugh from farther back in the compartment. The F.B.I. woman had quit conspiring to listen; it seemed she'd heard that song before. "It's true," he said desperately. "And anyway it's your fault, Dom."

That jolted me. I opened my mouth to ask what he meant, but he was ahead of me. "You could have stopped it! You could have come after me. Why weren't you peeping me the whole time?"

The gall of the man! That was back in the early days of the project, before we had learned so simple a trick as send-

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ing someone through with a self-contained conductive suit so he could be picked up and returned without a portal—long before we had the resources to mount both portal and peeper at the same time. "We didn't because we couldn't," I snapped. He gave me a rebellious look.

The bruiser took a hand in the conversation. "What are you going to do with us?" he growled.

The woman looked on silently. It was like hearing a puppet speak when its owner is absent; I was almost surprised to find the ape was capable of articulate speech at all. "As an attorney," he boomed—bigger surprise still!—"I got to tell you you're violating our civil rights like a million different ways, Charlie. You been keeping us incommunicado, which is depriving us of our habeas corpus; you ain't read us our rights or charged us with no indictable act or deed; you kept us from the right of consultation with our lawyer—"

"You said you are a lawyer," I protested.

"Even a lawyer has a right to a lawyer," he said virtuously, "so what the hell about it, Jackson?"

I looked helplessly at the woman. "Is this goon really an attorney?"

She shrugged, grinning. "Says he is. That's how he got into the Bureau. Personally I think he bought it from a diploma mill. Anyway, what about it?"

"What about what?"

"What are you going to do about us?" she asked politely. "Because, honestly, Moe's right. You must have some kind of laws around here, and I'm willing to bet you're breaking a whole bunch of them."

She was a lot too close to what I believed myself for me to be comfortable with the conversation. I tried diversion. "What would you do if you were me?" I asked.

"Why," she grinned, "I'd save up my money to pay off a hell of a huge damage judgment, once we get to court, and I'd probably start arranging my affairs for the next ten years in the slammer."

And that, too, did not seem at all unrealistic. I mean, given a good lawyer on their side, and a few bad breaks on mine. This sort of thing was not at all what I had been prepared to risk when I signed up for the project.

And it was all so unfair! I'd seen the bruises on Nicky DeSota's body. I'd heard him say what this pair had done to him. Civil rights? What civil rights had they given him?

And yet in their own time they weren't lawbreakers. They were the law!

I said slowly, "I don't think you really know what you're up against."

"Then tell us," she invited.

I hesitated. Then I reached back and picked up the phone. When the head stew answered, I said, "Will you ask the gentlemen in 22-A and 22-F to step down here? And, oh, yes, how about some breakfasts all around?"

It's a queasy feeling looking at yourself. I'd had it often enough before through the peepholes, looking at one Dominic DeSota or another in one time line or another—it was even queasier when I couldn't find any Dominic DeSota at all. (Or sometimes no any-

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body, but I don't like to think about those time lines.)

The worst part was wondering where I had gone wrong. Or sometimes where I had gone right—but always different. I couldn't say that Senator Dom had gone wrong. Even in the ill-fitting and dirty fatigues, munching his not very good hash-browns, he looked like somebody who had made something of his life.

But what about the other one?

He surely did not look like any kind of success. Rumpled business suit—and long pants at that! Imagine long pants in August! He didn't sound that way, either. He talked like somebody whose world wasn't much to begin with, and lately had gone definitely sour.

Still, I could see him livening up before my eyes. When the pulseur took off he was really shaken—closed his eyes, pressed his whole body back against the seat as though he were trying to disappear inside it. I made sure I had an airsick bag ready as we stood on our tail at eight hundred kilometers an hour. I couldn't blame him. He'd never been in a pulseur before, and not too often in even the clumsy old piston-engine walruses of his time.

I did not know if I would have done any better in his place. No, wrong. I knew I would not.

I wasn't sure I would have done as well as the Senator, either, though the fact that he had was encouraging. He was next to Nicky, helping him get the plastic off his scrambled eggs, watching me to see what I was going to say. When I didn't say anything for a moment, trying to figure out how to begin, he did. "Dom," he said, "I appreciate being rescued, but I've got responsibilities in my own time. Can you get me back there?"

"I hope so, Dom," I said.

He looked at me appraisingly. "You could have saved a lot of trouble if you'd told me what was happening the first time we met," he offered.

"I do what I'm told to do, Dom," I said. "There's a lot at stake here." The woman snickered; she'd had a lot of practice listening to people talk generalities when the specifics were embarrassing. I flushed. "I'll tell you anything you want to know," I said, "because you all have a right to that much, but let me start with the basics. Accord? You all know by now that there are parallel times. An infinity of them. We can't reach them all, not even by peeping—well, that's what 'infinity' means, after all. The only times we've been able to reach so far have diverged sometime within the last ninety or ninety-five years. Only a few hundred of those, actually, but there are some interesting ones. In some of them the Communists took over the whole of Europe by 1933, with that supreme military genius Trotsky running the country.Then there's a whole set where Franklin D. Roosevelt escaped assassination and lived to become President. So the country was spared the military takeover and the interregnum, when it turned out there was nothing in the Constitution to say who became President when a President-elect died before assuming office, and so Garner and Hoover both claimed the office—until the Army stepped in and imposed martial law. Then there were—"

"Dom," said the Senator patiently,

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"I guess we've got nothing better to do as long as we're on this airplane, but I don't know if history is the thing we're most interested in."

"I was only giving some illustrations."

"Sure. But we understand about parallel times—well, no, that's a lie. I don't *understand*. But enough to go on: every time some, I don't know, goofatron in the whatsicle splits there's a whole new universe created, right? Something like that? Well, why don't you first come to the nearest one instead of some world that's really a lot different, in a lot of ways?"

"Ah," I said, nodding, "that's a good question." I felt solid ground beneath my feet; I'd been through this with Senate committees and budget planners often enough. "First I'll give you the technical answer: it's because of what Steve Hawking calls 'permeable-fixed *n*-space contiguity,' if that's any help." I knew it wasn't. Snort from Moe, the anthropoid, varying expressions of polite detachment from the other men. Nyla Christophe was the only one who showed friendly concern, curiously enough. She gave me an encouraging nod as she dexterously scooped up her scrambled eggs. She didn't look at what she was doing, didn't drop a crumb, thumbless or not. And she didn't miss a word. "I'll give you an analogy. Think of the relationship between the time domains as a coiled spring, with each time strung on it, one after another, like a bead. If you number every bead, of course number five is right before bead number six, and right after bead number four—they're neighbors. But the spring is coiled. So time five may actually be touching time number six hundred and fifty-two, and on the other side of that one is maybe time number fifteen hundred and something, depending on what the radius of curvature is. Are you following me so far?"

"Maybe," called Christophe, speaking for all of them.

"Right. Then—I hate to do this—but, you see, the spring isn't curved in normal three-dimensional space. It's in *n* dimensions, and I don't know what *n* is. So proximity makes a difference —that's why we haven't been able to reach times where the split occurred more than ninety or ninety-five years ago, except in occasional fugitive glimpses. But the 'nearest' isn't the 'easiest' to reach, or anyway not always. Have I lost you?"

"Just about," said Nicky, smiling for the first time. "But it's fun to keep trying to understand!"

I said helpfully, "If you get a chance there's an asimov called *The Intelligent Man's Guide to Quantum Mechanics*."

"No, thanks," said Nicky. "But keep on, please."

"Well, that's about enough for theory. Some of you knew that already, of course." I glanced neutrally at our renegade Larry Douglas, who scowled and went back to his orange juice and roll. "So we developed the peeper, and then the portal. I don't want to go into the technology of that stuff. For one thing I can't—"

"But you're the fellow who invented it," called Christophe.

I shrugged. "If it's credit you're giving—well, no. Certainly not singlehanded. We had Gribbin and Hawking from England, Sverdlich from Smo-

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lensk—and, of course, we had all the French emigré scientists after Bartholomew Two, so we had a solid base of mathematicians and nuclear physicists available. But if you're blaming me—Well, I'll take that." I took a deep breath. "Because what we hadn't counted on was ballastic recoil."

I don't know what sort of reaction I had expected. I got three different ones—four, if you count the flic, who looked worried. Larry looked despondent. The other Larry and the two F.B.I. people looked opaque: the poker face was a Tau trait, I had discovered, probably because it was not a time when you wanted other people to know what you were thinking very often. And the two Dominics looked interested. I took a swallow of my cooling coffee—I hadn't even touched the solid food yet—and tried to explain.

"There's a tension between the worlds. Call it a skin. Once it's punctured anywhere, it is weakened everywhere. It's a little like that heat-sealed plastic wrapping that the meat comes in in supermarkets, you know?" They didn't. "Like the stuff your eggs were wrapped in," I said. "It's in a state of tension. When we puncture it anywhere it takes a lot of power, but then the skin is weaker—thinner—in other places. It's hard to predict just where the other places will be, because the geometry is fractal—well, never mind that; it's just hard. But it thins. At first radiation is all that gets through; then gases. Then—more than gases." I looked at our own Larry. "Since you, uh, left," I told him, "we've come across some bad ones. Large areas open, causing violent storms. And—well, there was one that killed a lot of people. Time Eta had built apartments over an abandoned railroad right-of-way. Two Diesels and four or five flatcars came through at eighty kilometers an hour, right into the lobby of a building, before it closed again."

Nicky put his hand up. "Doc? There were some stories about loud noises around a little airfield—could they have been that? From a time where they had rocketships, like this one?"

I started to tell him that a pulseur wasn't a rocketship but a jet, but caught myself in time. "I'd say probably yes," I agreed. "And we don't seem to be able to prevent it. At first we thought it was because of leakage of energy from our portal generators, and if we could control them better we could eliminate the ballistic recoil. But now we think it's really recoil, and there's a conservation law involved. If x amount of energy or matter goes from my time to yours, then x amount has to come back out of it again. Not necessarily back to mine. It may go to a third time entirely. It may go in fractions to several different ones.

"And we can't stop it."

"Jesus," said Nyla Christophe contemptuously. "You guys are playing with dynamite. Talk about irresponsible!"

Senator Dom cut in. His tone was less accusing, but a long way from really friendly. "Wouldn't it be a good idea to stop all this until you learn how to control it?" he asked.

"A damn good idea," I said fervently. "Only it got out of our hands when Larry got captured in Gamma. We

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could stop. But we couldn't both stop and keep an eye on them—not to mention the other times that were getting close, like yours, or that looked as though they'd be dangerous if they ever did get anywhere, like Ms. Christophe's."

The Senator said temperately, "I'm in no position to blame you for anything, Dom. If we'd moved a little faster my time might've been the first to break through, and I don't have any reason to believe we'd have done better. But—it scares me, Dom. I wish we'd thought a little more about the consequences before we got started. Those are big risks to take, just for the sake of developing a new weapon."

I lost my temper. Not at him. At myself, mostly, because of course he was saying nothing I hadn't said to myself a good many times over the past months. "You can't stop scientific research because there might be some danger somewhere!" I snapped. "Anyway, who said anything about a weapon?"

He looked surprised. "I only thought that it was obvious—"

"Maybe to savages the military application was obvious! Do you have any idea at all of what paratime means to research in general? Especially in the sciences that can't perform experiments?"

"I don't know exactly what you mean," he frowned.

"Think about it! Sociology, for instance. You can't isolate societies and perform experiments on them. But here we have an infinite number of societies, as like to our own or as different as we could want: we can develop a science of comparative sociology! Or economics, or poli-sci, or any of the social sciences at all. And not just the soft sciences! We had a meteorologist who came in as a research fellow. He went out of his mind when he discovered that your time, Nicky, hasn't had an Atlantic hurricane sweep up the coast in thirty years. We've been having them one or two a year and the damage is terrible. Now they think it has something to do with industrialization and urban sprawl; if we know that, maybe we can do something to stop it. And—trade."

The Tau Larry Douglas pricked up his ears. "I don't get what you're saying, DeSota," he said. "What kind of trade between two sets of the same people?"

"Two sets with slightly different histories. Slightly different fads, for one thing—there's a twenty million dollar business in hula hoops that came out of our peeping a year ago."

For once there was unanimity among my guests. All looked blank at once. "What's a hula hoop?" asked Larry Tau.

"A kind of a toy, that's all. But I'm not just talking about toys, I'm talking about a lot more valuable things. Think of it this way. If each time spends, oh, call it a billion dollars a year on research and development—and if you can skim the cream of the R&D for fifty different times—then, even with all the duplication you're bound to find you still multiply your R&D results by a bunch!"

Silence for a moment while they digested that. Then Nicky said slowly, "I guess I can see what you're saying, Dom. You can't find out things unless you try them, so there's a risk in any

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kind of science; all right. And I guess getting other people's research to add to your own would be a big help, all right. But still—honestly, Dom, I don't really see how you expected this thing to do much for the ordinary slob in the street. Like me."

"It could save millions of lives, for one thing," I said.

"Come on! You mean by defeating an enemy before he defeats you, something like that?"

"No, not that. Maybe that would be true sometimes, but it's not what I'm talking about. Do you know what nuclear winter is? The death of everything because nuclear war throws so much dust into the air that it hides the sun, long enough to kill off nearly all the vegetation and most of the large animals—including human beings?"

They hadn't; but they understood it quickly enough. "Is that what you mean by a benefit?" Christophe sneered. "Killing everybody?"

"Of course I don't. But there are times where it has happened. There are times we have reached where there are no mammals larger than a rat still alive—because the war did happen, five, ten, or more years ago, and the human race simply exterminated itself."

"Lovely!"

I kept a grip on my temper. Not easily. The woman got under my skin—was having the same effect, or some even more penetrating effect, on the Senator, because he was looking at her with an expression I can only describe as fascinated. "No," I said tightly, "It isn't lovely at all. It's just a fact. Some time lines have a virgin planet. The land is there, even the cities are sometimes there, though they're damaged. But there aren't any people to live in them.

"And then there are other times, our own included, where there are people dying and starving for lack of homes and land. Our Africa has been in a drought condition for most of the last decade. Parts of Asia are almost as bad. In other times Latin America has its own famines.

"Suppose we took those starving people without land, and let them emigrate to the empty planets without people?"

Nicky DeSota shouted, "That's *wonderful*, Dom! You've given new life to millions of people! How do they get along in their new world?"

He was ecstatic. I knew exactly how he felt. I'd felt the same thing—once. I said carefully, "Of course, they need support. It's not just the people. They need their animals, sometimes they need machinery, almost always they need doctors and teachers to show them how to farm new kinds of land . . . or, at least, they would. We haven't done it yet."

Crash went Nicky's exuberance. Up went Nyla Christophe's smug contempt. "Do-gooders," she said, shaking her head.

"Why not?" begged Nicky.

"Three reasons," I said. "First, we came across the ballistic-recoil problem. If we can't prevent that, or at least control it, we can't risk any large-scale transfers. We may have to stop using portals at all. And, second—" I looked at my old friend Larry Douglas. "There's the Gamma situation."

He moved sulkily, but didn't speak.

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He had already told us that he couldn't help giving them the portal. He had nothing to add.

The Senator frowned. "You mean the people who took over Sandia."

I said, "It's not just Sandia any more, Dom. There's a shooting war now. It isn't big. It's only in Washington. But the Gammas have occupied all the Potomac bridges, the White House itself and the National Airport—what you call Hoover Field. And there have been some nasty fire-fights. We think there are at least five hundred casualties. The first thing we have to do, since that's our responsibility in a way, is put that fire out . . . if we can."

I had the Senator's full attention now. "Oh, my God," he said.

I tried to reassure him. "The fighting has died down now," I said. "As of half an hour ago, there wasn't anything more than sniping—of course, a few civilians are still getting killed—"

It did not seem to reassure him at all. "Civilians!" he cried. "But why don't they— I mean, at least they could— Aren't they evacuating the non-combatants, for God's sake?"

"I believe there is some of that, yes," I said, puzzling over his reaction: He had already told me that his family was a thousand miles away, in his Chicago home.

"I've got to get back," he said strongly.

"We're going to do that, Dom," I said—"I think. You understand that it isn't up to me. But that's what I've recommended. In fact, I've recommended that we all go through to Washington D.C. Epsilon—that's your time, Senator—to show them what is happening, and offer whatever help we can. Almost all, I mean," I added, glancing at our own Larry Douglas, who shrugged, unsurprised.

There was an interruption from the other Larry Douglas. "I don't want to go back anywhere," he said.

"I beg your pardon?"

"I claim sanctuary!" he said forcefully. "I don't want to go back to my own time, because of, uh, political persecution, and I don't want to go skylarking around to get involved in whatever damn wars are being fought anywhere. You got me into this mess. You owe me something. I want to stay here."

The big goon rose threateningly in his seat. So, immediately, did the *flic-de-nation*, reaching for the holstered dart-gun at his side. Christophe put her hand on Moe's shoulders, and the big man subsided at once, though the look he gave Douglas-Tau was murderous.

"We can talk about that later," said Christophe pleasantly. "Let's deal with one thing at a time. You said there were three problems. You've only told us two of them."

"Ah, yes," I said somberly. "The other new element in the equation. We're being peeped ourselves. We don't know who, or for what purpose. But it's happening."

Christophe chortled, "Welcome to the club!"

Our Larry said pettishly—brave with the flic between him and her—"Oh, shut up, you. Dom? Is this something new since I, uh, left?"

I nodded. "We don't know the source. We can't trace it back—there's indications that they're using technology a lot

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better than anything we've got. But we get instrument readings from at least fifty places. Somebody's watching us, and they've been doing it, now, for about three months."

"So you're in the same spot we were a few days ago," said the Senator neutrally.

"I'm afraid so," I said.

He pursed his lips, thinking it through. "And what are you going to do now, Dom?" he asked. "Are you going to send me back to my own time?"

"I think that's what they've got in mind, Dom," I said. "In fact, I think we're all going. You because you live there. Me and Larry because we can tell them things they need to know to defend themselves. And the others because —well, because they're living proof of the existence of other worlds." And because they're a nuisance, I thought but did not say out loud: a couple of F.B.I. people and a mortgage broker, who needed them in our time?

I took a forkful of my scrambled eggs at last. They were cold and awful, but I didn't have much appetite anyway. ■

CONCLUDED IN NEXT ISSUE

ON GAMING

(continued from page 89)

type in as instructions to the computer, and explains how to ask questions, perform maneuvers, and talk to your crew.

When you ask questions or give orders, each character responds with text inside a personalized colored box on a different place on the screen. For example, when Mr. Spock speaks his words appear as green letters in a green box located to the right-center, while Uhura's answers appear in a royal blue box located to the lower right.

A continuous display across the bottom of the screen shows the status of the *Enterprise*, including such things as present warp speed, number of photon torpedoes available, condition of engines and dilithium crystals, and present coordinates.

Immediately above this display is a gray area marked "Kirk." This box is where your present and last preceeding commands are shown. The upper half of the screen is a sky blue box where scanner readouts and other computer reports appear upon request. If you give a command the computer does not understand, it tells you "You must use accepted Starfleet protocol" instead of "I don't understand" as in other computer games.

The Kobayashi Alternative does an impressive job of maintaining the feel of the popular *Star Trek* series. With ten areas to explore, the game has a lot of play value—you'll probably need to "save" the game up to that point and come back to it several times in order to complete the adventure. And, of course, there are Klingons out there somewhere.

Even if you're not a fan of *Star Trek*, the game is challenging and different from most of the other science fiction computer games available. If you enjoy *Star Trek*, as I do, you'll have even more fun playing the game. This one is well worth considering. ■

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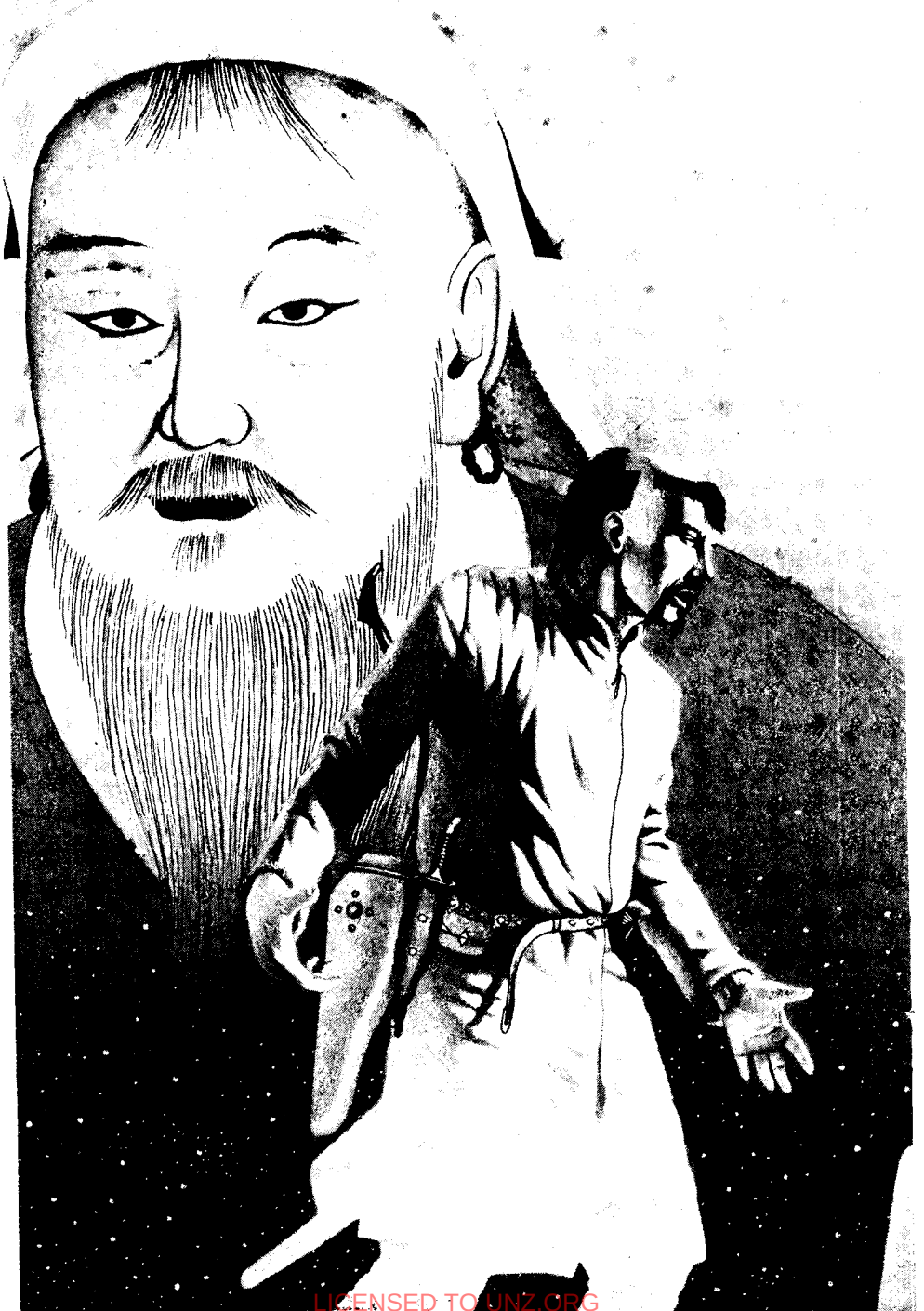

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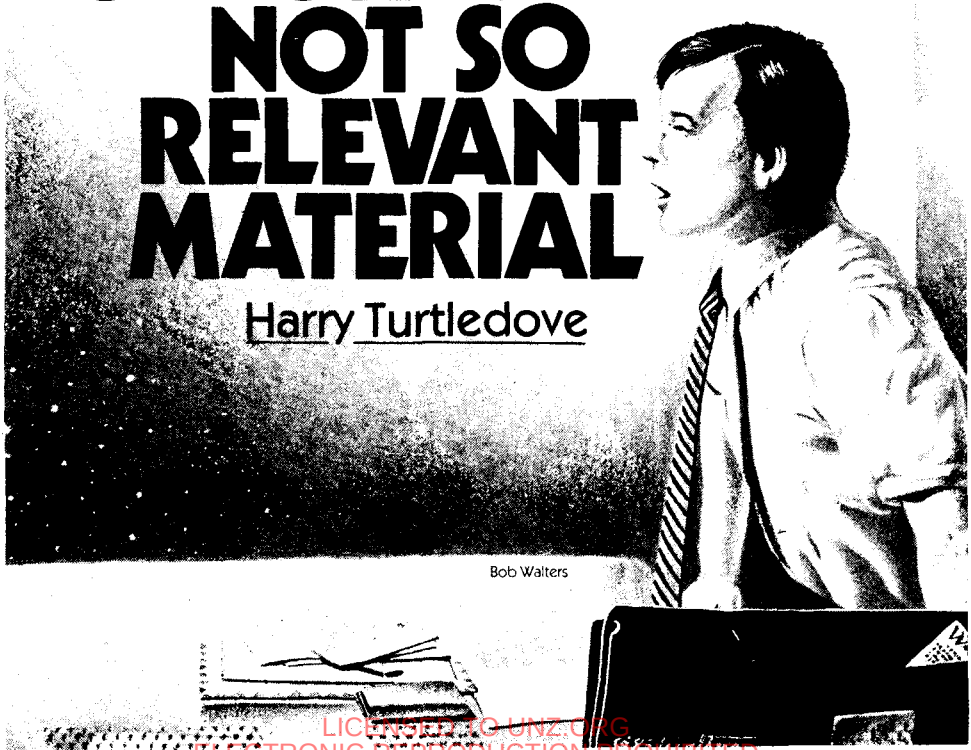
If you think this is farfetched, just think of how many New Yorkers *really* have an accurate picture of where Los Angeles is relative to Denver—or vice versa!

THE BARBECUE, THE MOVIE, AND OTHER UNFORTUNATELY NOT SO RELEVANT MATERIAL

Harry Turtledove



Bob Walters

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T.G. Khan looked out the window at the traffic going by on Imperial Highway. He wished he were under the warm Los Angeles summer sunshine, instead of sitting here cooped up in an office trying to put a newsletter together.

He sighed. He had gone through some impressive finagling just to get an office he could see out of. Until a few weeks ago, he had worked in an enormous interior room, the kind where you need to leave a trail of bread crumbs to find your way through the maze of partitions. "Cubicle, sweet cubicle," one typist's sampler read, which perfectly summed up the place.

The newsletter he was writing bored even him. He sighed again. "It beats sleeping on a park bench, I suppose," he said out loud, and mounted another dispirited attack on his word processor.

The phone rang, its chime booming like Big Ben over the soft, incessant Muzak. Khan's fingers jerked. A rash of consonants broke out on the screen. He stared at them reproachfully as he picked up the receiver. "T.G. Khan."

"Someone here to see you, Mr. Khan."

"Thank you, Doris." His secretary still worked across the corridor in the huge office from which he had recently escaped. "Send him in."

"Yes, sir," Doris said, and giggled. Khan wondered if his ears were playing tricks on him. Doris hadn't even cracked a smile for the limerick about the crypt at St. Giles, whereupon he had given her up as a hopeless case.

The door to his office came open. So did his mouth. The door closed. His mouth stayed open.

The man who walked into his office was in his late twenties, a few years younger than Khan, and looked vaguely Semitic. He had a thick Fu Manchu mustache, and the strangest hairdo Khan had ever seen—and, living in Los Angeles, he had seen some lulus. The top of the man's head was shaved. So was a strip that ran from ear to ear through the bare spot on top, and an inch or so on the forehead. The rest grew long, in greasy braids.

The man wore a heavy fur coat over leather trousers and boots. He must have been dying out there in the heat, Khan thought. Two scabbards hung at the fellow's belt, one holding a knife, the other a curved sword. He smelled of sweat and rancid butter. The worst thing was that Khan recognized the costume, though not the person in it.

He rose from his chair, feeling hot blood rush to his face. He had not been in a fight since the sixth grade, but he wanted to punch this fellow's lights out. "If you're not a singing telegram, pal, you're in big trouble," he said between clenched teeth.

The man did not burst into song. Khan, who tended to think too much for his own good, took another look at the cutlery the fellow was carrying, and decided that trying to kill him might not be such a good idea after all.

He stood, irresolute, and the moment passed. His shoulders sagged. "Very goddam funny," he said bitterly, hearing the weakness in his own voice and hating it. "I presume you know my father."

To his amazement, the man in front of him went down on his knees, then thumped his forehead on the cheap indoor-outdoor office carpet. The door

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clicked shut at the same time. That made the stale, greasy stench worse, but it also kept anybody walking down the hall from seeing what was going on inside.

Fat lot of good that would do, Khan realized. He clapped a hand to his forehead in horrified dismay. Doris, damn her blabbing soul, would spread this all over the office, and so would everyone else who had spotted this kowtowing weirdo. How would he ever be able to look people in the face again?

He had to drag his attention back to the fellow, who, his face still against the nubby knit nylon, had started to talk. "No, excellency," he was saying in a voice Khan seemed to hear between his ears rather than with them, "never did I have the privilege of meeting that great hero Yesugei. I—"

"Say, you *are* good," Khan said with grudging admiration. Not one in a million knew who Yesugei was, or cared. He wished—oh, how he wished!—he didn't himself. "What are you, one of dad's grad students? If you wanted to get hold of me, why didn't you just call?"

The man lifted his head from the rug, looked at Khan with as much perplexity as Khan was giving him. "I had not thought to find the phrase 'grad student' on your lips, mighty lord."

Khan's head was starting to spin. The most likely idea he'd had—and it wasn't very—was that the maniac who would not get off the rug was some Syrian or Egyptian studying with his dad who wanted a favor from him. That would explain the flowery speech, at least. Why the fellow had to get into costume for that, though, was beyond him.

"Look, tell me what you want and take off, okay?" he said.

The stranger's head went thump on the carpet again. "Merely the boon of observing you for a brief while, mighty lord."

That was so far from anything Khan had expected that he blurted, "Who the devil do you think I am, anyway?"

"Surely your excellency can be no one else but Temujin, Genghis Khan—"

"Yes, thanks to my old man I *am* Temujin Genghis Khan," Khan said, wishing for the nine millionth time that his father had dug ditches for a living instead of being a professor of Mongol history. It had made him the only first-grader at Oakdale Elementary School ever to be called exclusively by his initials.

The fellow on the floor went on as if he had not spoken: "—unifier of the Mongols, conqueror of north China, subduer of the Khwarizm Shah, ravager of Russia, builder of the hugest empire the world has ever seen—"

"—Tech writer, in debt, divorced, driving an old Toyota," Khan finished the litany. He looked down at the stranger groveling before him. "You're carrying on as if I were the real one, or something."

That hangdog, puzzled look was back on the man's face. "Again you use strange terms, O Khan. Assure me, I pray, the pangloss properly renders my words into the Mongol speech."

"Mongol?" Khan was too far out of his depth not to come back with the automatic truth. "This is English."

"English?" The stranger's eyebrows rose. "I've heard of it, I think. Then

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this is not the imperial yurt at Karakorum?"

"It's Los Angeles."

"Where?"

They stared at one another, each plainly convinced the other was crazy. At last the stranger said in a small voice, "Tell me the date, please."

"Huh? It's July 16th."

"The year?"

Now positive he was humoring a madman, Khan gave it to him. The next question confused him for a moment: "In what era is that?"

He finally figured out the meaning. "Christian. A.D. *Anno domini*. The Common Era—C.E.—if you don't care for Christian dating of any flavor."

One of those terms must have been familiar to the stranger. He screwed up his face and began to swear in a style that was bizarre but effective just the same. Khan filed a couple of the choicer epithets to use himself. "Lizard piss" could come in handy almost any time, but he decided to save "sucker at the tit of a syphilitic sow" for when he really needed it—say, when a Mercedes cut him off on the freeway.

When the stranger finally ran out of oaths, he turned a face full of storm-clouds on Khan. "You are certain this is not central Asia in what you would call—let me think—the early thirteenth century?"

"Not the last time I looked," Khan said solemnly. He wished he could remember the security guard's extension.

But instead of turning violent, the man in the Mongol clothes burst into tears. Khan watched, amazed, as he unashamedly wept until he had cried himself out.

At last the stranger pulled himself together. He smacked fist into palm in frustration. "Oh, to have come so close and still missed! What are seven hundred miserable little years against fifty or sixty thousand?"

Khan's head was aching badly by now. He had had as much of this exchange as he could stand. "I'm so sorry," he said with exquisite, ironic politeness. "You must be a time traveler, sir, and all this time I took you for a nut."

The stranger waved it aside. "A natural error. However, if I were a nut, I would not be able to do this, for instance." Afterwards, Khan would have sworn the fellow only pointed his finger at the office window, the window he had schemed so long and hard to get. A ray of blue light shot from the stranger's fingernail. The next moment, the glass wasn't there any more.

July smog immediately started competing with the bland but breathable product the air conditioner turned out. Khan coughed.

The stranger's eyes went ecstatic (they also began filling with tears that had nothing to do with emotions). "The scent of burning hydrocarbons!" he exclaimed, breathing deeply, at least until he choked. "Undoubtedly from buildings torched in the search for loot."

"No, from dinosaurs torched in the search for a parking space." Khan's tongue led its own life, wild and free, while he tried to figure out whether he believed what he had just seen. He decided he did. His eyes might fool him, but he trusted his lungs. No way they could hurt so much unless the window glass really had disappeared.

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"To have come so close!" the stranger said again. Now that he was no longer abasing himself, Khan saw the motions of his lips did not match the words the tech writer was hearing. The fellow shook his head in chagrin. "There goes my academic career, all because the scrofulous temporal phase link dropped me into the Late Middle First Primitive instead of the Mid-Middle." He started to cry again.

He seemed to be talking more to himself than to Khan, but his—what had he called it?—his pangloss kept working: "I can't understand it. I was supposed to home on the mental vibrations of Temujin, Genghis Khan—"

He and Khan realized at the same time what must have happened. Fury replaced the tears. Khan waited for that finger to blast him to wherever the window had gone. The look on the fellow's face said that might not be good enough—the sword might come out instead.

Then the stranger tried to master himself. It was a visible process, and audible. "Because I observe savages," Khan heard, "must I behave as one?"

His earlier wild mood swings made *yes* an all too likely answer to that. Khan said quickly, "Can't you just go on to the Temujin you really wanted to see?"

"It doesn't work that way," the stranger answered bleakly. "Once I am out of the temporal flow, returning only snaps me back to my own time, and then what am I? A graduate student in ancientest history without fieldwork, without a dissertation—and a laughingstock for the entire Collegium."

For the first time, he seemed a real person to Khan, because the tech writer understood what he was feeling. His own education had ground to an ignominious halt a few months after he got his bachelor's degree, when he had to admit his brain simply was not up to graduate work in physics—that being a subject as remote from Mongol history as possible.

He said, "Maybe you could do your work on twentieth-century America instead of the Mongols?"

"I don't know anything about the Late Middle First Primitive," the time traveler said petulantly—narrow specialization looked to be a universal constant.

"Maybe if you had a guide." Anything, Khan thought, to get the fellow's mind off his anger, and off his ferocious finger. "I could do it, if you like. We've come a long way since the thirteenth century, you know."

"I doubt it."

Stung by the morose dismissal, Khan snapped, "I'm going home in a few minutes. Come along if you want, or else don't."

"I'll come," the stranger said, sighing. "I may as well. It won't help, though. Nothing will help."

He was so woebegone that Khan's sympathy revived. "It won't be so bad. You'll get to see just about all of Los Angeles during the ride." As far as he could remember, that was the first time he had ever had anything good to say about his daily commute. He lived in Reseda, in the western part of the San Fernando Valley, about forty-five miles northwest of where he worked. Some days it felt as though he spent more time in his car than on the job.

After saving the document he had

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been working on when the time traveler arrived, Khan undid his tie, slung his sportcoat over his shoulder, and said, "Well, let's go, uh—what do I call you, anyhow?"

"My name is Lasoporp Rof. My friends would call me Rof. You call me Lasoporp."

So there, Khan thought as they walked out of the building. The security guard gave Lasoporp Rof an odd look, but only a brief one. Clothes did not make the man, not in L.A.

The time traveler showed a small revival of interest in the parking lot. "This is your trusty Mongol steed, Temujin Genghis Khan, able to travel long distances without tiring?"

"You can call me T.G.," Khan said, pleased to get a little of his own back. "And this is my trusty Japanese Toyota, Lasoporp, able to travel long distances without running out of gas."

Lasoporp Rof grunted and got in. "How far must we fare to your yurt?" he asked when the tech writer had joined him.

"My condo," Khan corrected absently. "How is it you know all this Mongol history without knowing anything else?"

"Some records of the Mongols survived the First Great Lacuna to be translated into Snoit."

"That's your language?"

"Gods and goddesses, no! But it was a liturgical language all through the First Intermediate and the Second Primitive, up to about nineteen thousand years before my time."

"Oh."

"How long will the journey to your yurt take, T.G.?" Lasoporp Rof asked as Khan got on I-605 going north.

The tech writer ignored the slip; he was concentrating on his driving. "An hour if there were no traffic, an hour and a half on a regular sort of day, two hours if things jam up badly." Close to a dozen different combinations of freeways would get him home. None was much faster than any of the others.

The first chokepoint was on the Santa Ana Freeway, where it narrowed from four lanes to three a little south of the junction with the Long Beach Freeway. Traffic crawled along, but by moving from lane to lane Khan was able to stay right at sixty. He blinked; he couldn't remember holes opening up so conveniently. He was not about to complain, though.

"We are passing cattle?" Lasoporp Rof asked.

"We're passing trucks," Khan said. He glanced over at his passenger. "Don't you know the difference between animals and machines?"

"What is a machine?"

Defeated, Khan gave his attention back to the road. The Santa Monica and Hollywood Freeways branched off the Santa Ana a little east of downtown. He took the Hollywood. That was the shortest route, even if it always did knot up just north of the civic center.

And it was knotted, except that, as before, spaces kept appearing like magic for Khan. Other drivers looked at him with envious disbelief as he slid from one to the next. He had never seen anything like it. The second time he had that thought, his head snapped round toward Lasoporp Rof. He'd never ridden with a time traveler, before, either.

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"Do you have anything to do with this?" he demanded.

"With what?" Lasoporp Rof asked. "Oh, do you mean am I helping us get through the herd? I find this nomadic excursion grows boring after a while, so I'm exerting a slight probability distortion to help us along. I can take it off, if you like."

"That's all right," Khan said hastily. He did not even bother correcting Lasoporp Rof about the right name for the traffic jam; plenty of times he'd felt like one wandering sheep in a million. "I wish I could do it, that's all."

"Can't you?" Lasoporp Rof said, surprised yet again. "Here, let me induce you. It will help pass the time."

He put his hand on the back of Khan's head. As the tech writer drove, he began to have a feel for where a hole in traffic might be, could be, would be, *was*. Guiding the car into that hole was easy as breathing. They were nearly at the junction of the Hollywood and Ventura Freeways when Lasoporp Rof said, "Now you're doing it all yourself."

"Am I? By God, I am!" Maneuvering the Toyota as if it were a halfback dodging clumsy tacklers, Khan felt grateful enough to do anything this side of human sacrifice for Lasoporp Rof. He even thought about putting the time traveler on a plane to North Carolina to meet his father. To him, though, anything to do with his dad was not this side of human sacrifice.

He had an idea. Instead of staying on the westbound Ventura, he went north on the San Diego Freeway several miles to Devonshire, got off, went up to Chatsworth Boulevard, then headed west. He was whistling when he pulled into the parking lot.

"This is your yurt? No, your condo, you called it?" asked Lasoporp Rof.

"No, this is a Mongolian barbecue place, a restaurant that serves Mongolian-style food," Khan said. When Lasoporp Rof looked blank, Khan went on, "When you go back to whenever your own time is, won't you want to be able to tell everyone about the authentic"—well, sort of authentic, he amended mentally—"Mongol feast you had back in the First Primitive? You wouldn't even be lying."

For the first time since Lasoporp Rof had discovered Khan was not a world conqueror and mass murderer, the time traveler actually looked happy. "Thank you, T.G.; perhaps I may yet bring some valuable knowledge with me after all. Yes, let us go in."

A bored Oriental woman seated them, handed them menus. "She does not even recognize my costume," Lasoporp Rof said plaintively. "How can she be a real Mongol?"

"She probably isn't. Mongolia and the United States—this country—aren't friendly with each other."

"Ah, still you live in fear of the savage Mongol horsemen!"

"Not quite." Khan said, and was saved from disappointing Lasoporp Rof with further explanations when the waitress came back. He ordered tea for both of them, and steamed rice, then pointed to the trays of meat and vegetables lined up in front of the barbecue, saying, "We'll build our own." That was what most people did; she nodded and left.

Khan led Lasoporp Rof up to the food. After they had taken bowls, the

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tech writer said, "There's lamb, beef, pork, and turkey. Help yourself." He wielded the set of aluminum tongs in each tray.

Imitating him, Lasoport Rof said, "These are sliced thin so as to cook quickly?"

"That's right." Khan grinned; it was the first question the time traveler had asked that actually made sense. Khan added sliced onions, bean sprouts, celery, and cilantro to his bowl, splashed hot barbecue sauce and curry sauce over the contents. "Spicy," he warned, but Lasoporp Rof again followed suit.

Then Khan handed his full bowl to the cook behind the round barbecue griddle that was the most nearly genuine part of the whole operation. The cook grinned, displaying gold teeth. He upended the bowl. Meat and vegetables snarled as they hit the hot iron. The cook stirred them with a long-handled wooden spoon, chivvied them three fourths of the way around the griddle, and deftly put them back in the bowl. Khan returned to his seat while the cook barbecued Lasoporp Rof's dinner. The time traveler watched, fascinated.

When he rejoined Khan, the tech writer had to show him how to use a fork; he held it as if it were a dagger. His eyes watered at the first mouthful, but he bravely emptied his bowl, exclaiming, "I feel like I'm tasting history!"

Having no atmosphere, the place was not expensive. Khan peeled off a ten, a five, and a couple of singles, left them on the table as he and Lasoporp Rof walked out. The time traveler said, "Though you are enemies of the Mongols, I see your people have adopted their custom of paper money."

"Uh, yes."

Lasoporp Rof looked round as they were getting back into Khan's car. The landscape was typical Valley urban sprawl: a couple of gas stations, a 7-Eleven, a donut shop, streetlights, and cars, cars, cars. The time traveler sighed. "This is not the steppe, I suppose?"

"Does it look like the steppe?" Khan asked. He had meant it as a rhetorical question, but realized it wasn't: how would Lasoporp Rof know what the steppe looked like?

"I really wish I could see the steppe." Lasoporp Rof sounded so sad that Khan wished he had kept some of the books his father pushed on him, instead of unloading them because they reminded him of his godawful name. They would have given the time traveler some picture of Mongol life.

"Picture!" The force of his inspiration made Khan want to hug himself with glee. He fired up the Toyota. "Come on, Lasoporp, I'll show you the steppe, by God."

"It is close by?" the time traveler asked eagerly.

Khan drove through several lights that probably should have turned red but stayed green. (He was learning.) He pulled into a small shopping center. "Wait for me here. I won't be long —amuse yourself quietly till I come back." He hurried into the record store across the way.

When he got back with his package, he gasped and thanked his lucky stars he hadn't parked by the big display window. "Close your coat!" he shouted.

"You told me to amuse myself."

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"I said 'amuse,' not 'abuse.' " Sweating, Khan shook his head in relief that no one had happened by. "Never mind; not your fault. It's not our custom to do that kind of thing in public, that's all."

Lasoporp Rof let out an audible sniff.

The drive back to Khan's condominium went faster than it had any right to. Lasoporp Rof was sulkily silent until they were actually inside and Khan flicked on a light. "That is not fire. I've seen fire. It flickers."

"It's done with electrically heated wire." When Khan saw that meant nothing to the time traveler, he asked, "Well, what do your people use for artificial light?"

"Sun pills, of course," was what he heard through Lasoporp Rof's pangloss. It made no more sense to him than his explanation had to Lasoporp Rof.

He gave up. Waving the time traveler to his couch, he said, "Sit down, make yourself at home. Can I get you a beer—a cold, mildly alcoholic drink?" Khan laughed at himself—he was starting to give definitions without even thinking about it.

"Yes, thank you."

When the tech writer came back with two cans of Coors, he found Lasoporp Rof examining the Israeli-made menorah that decorated his coffee table. "What a strange coincidence," the time traveler said, picking it up. "If you had one of these in my own time, I would think you were Jewish."

"Very strange," Khan mumbled. With some reluctance, he let it go at that: it was either let go or spend the next three weeks asking questions.

He turned on the television. Lasoporp Rof watched curiously as the screen lit up in bright colors and music came out of the speaker. It was a denture-adhesive commercial. Feeling his cheeks grow hot, Khan was glad to get rid of it and turn on his VCR. The warning about unauthorized duplication at the front of the tape meant nothing to Lasoporp Rof, and this time the tech writer did not bother to explain.

Then the movie came on: a 1964 epic starring James Mason, Omar Sharif, Robert Morley, and a Telly Savalas who still had hair. Khan realized the time traveler could not read the credits rolling across the screen. "It's called *Genghis Khan*," he said helpfully.

Lasoporp Rof almost jumped out of his furs and leathers. "This is a real record of his life?"

"No, a drama based on it. How could it be a real record, Lasoporp? We can't travel in time."

"First Primitive," Lasoporp Rof said, as if reminding himself. That did not keep him from being a spellbound audience for the Far Eastern horse opera. Khan had only seen parts of it on late-night TV. The knowledge of Mongol history his father had crammed down his unwilling throat made him wince at the inaccuracies, but Lasoporp Rof was plainly eating it up, battles, overwritten love scenes, and all.

When it was done, the time traveler said, "Let me see it again, so I am sure I have the sense impressions fixed in my memory. Together with the meal, it should give me enough material to keep my professors happy."

Khan blanched. Watching this two-hour turkey once had been bad; going through it twice came too close to cruel

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and unusual punishment. As he watched, he felt a twinge of guilt at what he was doing to far future historiography. He stifled it, but it made him wonder how much of what his father called historical fact was based on similarly trashy sources. A good bit, probably. He smiled, liking the idea.

At last the ordeal was over. Lasoporp Rof leaned over and kissed Khan on both cheeks, then square on the mouth. "Thank you, T.G., thank you, thank you," he said, and then he was gone, vanishing suddenly and silently as a popped soap bubble.

Khan blinked and shook himself like a man emerging from a dream. He wondered if the evening had been just that, or an out-and-out hallucination. But his living room still reeked of rancid butter, there were beer cans on both ends of the coffee table, and never in his wildest nightmares would he have rented *Genghis Khan*. Besides, tomorrow morning the janitor would be asking him where his office window had gone.

And there was that probability distortion stunt—

He looked at his watch, saw to his surprise it was only a little past ten. Thanks to Lasoporp Rof's trick, he really *had* made good time on the road. He got out his address book, picked up the phone, punched buttons.

"Hello?"

"Jennifer? Hi, this is T.G. Feel like dinner and a movie Saturday?" He held his breath with the effort of bending the odds, then let it out in a disappointed gust as she said she was going to a party that night. That made the third time she'd told him no.

"—but I'd love to, the weekend after," she finished. Khan made the arrangements and hung up, feeling a bit like a world conqueror after all. ■

ON BEING A PARASITE

● A predator is an animal that eats other animals, generally those smaller and weaker than itself. We respect predators, paint them on our coats of arms and use their names as adjectives of quality. To be termed lion-hearted, cat-footed and as strong as a bear offends no man. A parasite is an animal that eats other animals that are always larger and more powerful than itself. We despise parasites and to call a man a louse, which is, after all, a courageous little animal in its way, is to ask for trouble.

The Australian Museum

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the reference library

By Tom Easton

The Cat Who Walks Through Walls, Robert A. Heinlein, Putnam, $17.95, 384 pp.
Santiago, Mike Resnick, TOR, $?, ? pp.
The Postman, David Brin, Bantam, $14.95, 304 pp.
Act of God, John Maddox Roberts and Eric Kotani, Baen, $2.95, 288 pp.
Kelly Country, A. Bertram Chandler, DAW, $3.50, 348 pp.
The Proteus Operation, James P. Hogan, Bantam, $16.95, 416 pp.
The Nick of Time, George Alec Effinger, Doubleday, $12.95, 180 pp.
The Skook, J.P. Miller, Warner, $3.95, 307 pp.
A Theatre of Timesmiths, Garry Kilworth, David & Charles, Inc. (N. Pomfret, VT 05053), $13.95, 185 pp.
Duende Meadow, Paul Cook, Bantam, $2.95, 224 pp.
Circumpolar! Richard A. Lupoff, Berkley, $2.95, 296 pp.
The Custodians and Other Stories, Richard Cowper, David & Charles, Inc., $12.95, 191 pp.
Modern Science Fiction and the American Literary Community, Frederick Andrew Lerner, Scarecrow Press (52 Liberty St., P. O. Box 656, Metuchen, NJ 08840), $26.00, xviii + 325 pp.

A tip of the hat and thanx to: Jane Dillehay, Risé Peters, J. Kucera, Barrett Eynon, Jon Halman, Norman Kent, Uncle Tom Cobbley, and all. Never have I had such response from my dear readers as when I suggested (at least a little facetiously!) that Tom Robbins is S. Morgenstern. Now everybody knows that Tom Robbins is really William Goldman. Whoops! I mean Goldman is really Morgenstern. Morgenstern is really Goldman! That's it!

When Spider reviewed Heinlein's latest, **The Cat Who Walks Through Walls**, he raved. I've finally seen galleys for the book, and I've read them, and I want to say a few words myself. In my opinion, the book is *not* as great

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as Spider trumpeted. It's jaunty, lively, adventurous, and fun. But there is not an idea in *Cat* that was not developed at more and better length earlier in Heinlein's career. On the other hand, there are plenty of nice touches, from the minor, incidental character for whom the book is named to the numerous in-jokes, and I enjoyed the book.

Yes, I did. But, dammit, it ain't the greatest thing since sliced bread! It is ultimately a trivial tale, extending the story begun in *Time Enough for Love* for no purpose other than to continue the unification of the Master's body of work into a Future History that makes some kind of sense. If I were to take an iconoclastic turn, I might even suggest, hesitantly and respectfully, that the Masters of our favorite literature are taking the worship offered them by their readers too seriously.

As Spider noted, *Cat* leaves room for a sequel. I look forward to it. However, I do not really expect it to impress me more favorably.

Mike Resnick writes me that he tries to make every one of his books his best to date—or at least, no worse than his last. I'm not sure that he manages it every time, but I'm willing to grant him a general trend of improvement. And I'm willing to say that his latest, **Santiago: A Myth of the Far Future**, *is* his best yet.

Mike says he likes to tell fables. That makes him a fabulist, and his stories and characters fabulous. *Santiago*'s certainly fit. There is the tale's hero, the Songbird, former revolutionary, a bounty-hunter with a heart. There is Manmountain Bates, gambler and avenger of fraudulent markers. There is the Angel, deadliest of men, and journalist Virtue MacKenzie, and the pulpit-pounding Father William, who collects scalps and uses the bounties for good works. Outrageous. Preposterous. Fabulous, all.

And we should not forget Black Orpheus, the scholarly poet who, having lost his Eurydice, devoted his life to preserving the frontiers of the *Eros* cosmos in thousands of quatrains. Resnick uses him nicely to introduce his characters and as a bridge from scene to scene.

You can already sense a strong flavor of the American frontier, of mountain men and gunfights, of Paul Bunyan and Mike Fink among the stars. And that's what you'll find. From the enchantment of page one onward, the book reads like one of those compendia of myth and legend on which we all cut our literary teeth. Where Resnick has previously contented himself with single legends, centering on only one or a few of his trademark fabulous characters, here he invents them wholesale, endlessly and delightfully.

But what of the story? Where is the fable there? I don't want to give away too much, but here's the germ: The Songbird hears that the Angel has come to his region of space in search of Santiago, the greatest pirate of the age, raider and smuggler and murderer, bearer of the most generous bounty in history, and always elusively unkillable. The Songbird's informant tells him *he* should try to beat the Angel to the prize, and then he offers a clue. The Songbird accepts the gauntlet, and off the story goes, from bizarre character to preposterous. He acquires Virtue, the journalist, as an ally, and then Halfpenny Terwilliger, the welsher pursued by Manmountain Bates. Virtue defects to the Angel, Terwilliger dies, and the Songbird acquires Schussler, the cyborg spaceship (who does not sing). He garners more clues, and eventually he

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comes to Santiago himself, and then to the answer to his pet obsession: What must a compassionate revolutionary turned bounty-hunter do with his life?

Therein lies the moral to Resnick's lengthy fable. Compassion is the essential ingredient in true revolution. Too often it is missing, and that is why, throughout history, revolution has been no more than an interlude of ringing phrases and great confusion. Resnick shows us what a compassionate revolution must be, and he does so—as usual—most entertainingly.

Is anything missing? Are there clumsinesses or fatuities? Not really. Resnick is a careful composer and a wordsmith —never a "stylist"—whose direct, unadorned prose carries the story effortlessly along. He is fortunate in liking to tell the stories he does, for they lend themselves well to his way of writing; his style echoes that of the myths and legends of our past. My only possible objection—and it's small, a cavil, a quibble—is for verisimilitude. Resnick's galaxy is a small one, with people flitting across the parsecs as they haven't since the days of "Doc" Smith, and with the grapevine always preceding them. Everyone knows everyone else, too, no matter how far-flung their homes.

To Resnick's credit, he seems aware of this incongruity. He even puts into his tale a few reflections on the role of coincidence in myth and history. If they fail to convince, well, he's made his apologia and he's telling a myth anyway. In no way is he offering us an imagined slice of far-future life, even though he *is* prodigal with detail and ramification.

This one is a definite don't-miss. If you remember your childhood yarns at all fondly, and if you have any taste for fables, complete with morals, you will be delighted.

What is the value of myths? Let David Brin tell you. His **The Postman** is another delight. Sixteen years after a small holocaust that brought civilization to its knees with destruction of facilities, a brief nuclear winter, and rampaging macho survivalists, hero Gordon Krantz is stripped of his supplies by bandits. Luckily, he soon finds a dead mail carrier and dons his uniform. Then, when he walks into the next village he encounters, eyes light up in wonder and recollection. He responds by inventing a myth of a Restored United States and reinstituting a mail service to link the scattered settlements. He is amazed when his tendering of hope evokes more hope, a rekindling of the spirit of civilization, and fervent, almost religious loyalty to him as the emblem of the new age. Slowly, almost grudgingly, he accepts the burden of savior.

His task is not easy. There are people who think things are just fine as long as they are on top. There is an Oz offering competing hope. There is an invasion of survivalists led by two power-mad cyborgs. But, because of who he is and what he symbolizes, Krantz wins out.

The book begins with a glaring error which I hope will be fixed by the time you can buy it. Brin seems to think that bracken (ferns) are the thorny equal of brambles. That aside, the premise is ingenious and the story is marvelously hopeful, warm, and humane. I loved it, and I would love to see more in a similar vein. Unfortunately, though Brin leaves room for a sequel, I am not at all sure he should produce it. *Postman* ends on just the right note of promise and ex-

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pectancy; a sequel must inevitably flatten that note.

Not too many years from now, according to **Act of God** by John Maddox Roberts and Eric Kotani, the USSR will divert its highly successful space program from building colonies and exploring the Solar System to an effort to replicate the Tunguska event of 1908. The idea will be to use chunks of cometary ice as bombs, producing disasters their victims will take as acts of God. However, a defector will bring word of the shifts in the program, and an out-of-favor CIA "cowboy," Sam Taggart, will follow the clues to the truth. In the process, he will recruit one of the most engaging geniuses in SF history, the dwarf egomaniac Ugo Ciano.

Act of God is not quite the thriller its blurbs proclaim, for it is predictable. But it reads smoothly and quickly, without undue complications, and it is a highly entertaining book, not least because of Ciano. It may look like just another high-tech war scare, but go ahead. Read it. You'll have fun.

The late A. Bertram Chandler wasted the bulk of his writing career. That sounds strong, for it dismisses the Grimes yarns as so many potboilers. I know it. But though the Grimes stories were all successful, entertaining, popular yarns, they were much, much less than Chandler was capable of doing.

Chandler proved as much when he took a Senior Fellowship from the Literature Board of the Australia Council and wrote **Kelly Country**. The hero is a present-day Grimes (presumably an ancestor to the *other* Grimes), a clear alter ego to Chandler, a writer of historical romances rather than SF, who is invited by a newspaper editor to take part in a curious project. The centennial of bandit Ned Kelly's 1880 defeat at Glenrowan is approaching, and the editor has on tap a man who claims to be able to send a person's mind back along his ancestral time-line to share the awareness of his ancestors. He proposes that Grimes go back to view history in person, and then to write up the tale for the paper.

Grimes agrees, but once he is in the mind of his grandfather, he can't resist meddling. As a result, Kelly does not hang. Instead, he goes on to lead a successful rebellion and found a republic lead not by a president but by a "Kelly." When Grimes emerges from his trance, he finds a new present in which Australia, not the US, is bogged down in Vietnam; Canada is part of the US; revolution brews in Australian streets; and nuclear war looms over Sydney. But he sees little of all this. The Kelly is in charge of the project in the new "now," and Grimes must return to the past to write the definitive history of the founding of the republic.

Like the more familiar Grimes, Chandler's hero has his amorous escapades and save-the-day moments, proving a master of innovative weaponry—from steam-powered Gatling guns to armored steam-wagons to airships and bombs. Chandler piles "what if?" upon "what if?" to write a convincing alternate history so thoroughly imbued with his hallmark ability to entertain that even the despairing ending makes us laugh. And—of course—I recommend the book highly.

I have two more forthright time travel yarns, too. The first is James P. Hogan's **The Proteus Operation**, which begins in a 1975 America that confronts a Third Reich that had won World War II, gained nuclear bombs, and now stands ready to conquer the lone holdout against

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its despotic, genocidal power. Intelligence reports reveal that the Nazis won because they had help from the future, and the stolen blueprints for the time machine are in the hands of American scientists. They understand the technology just enough to mount a desperate, last-shot mission into the past to stop the Nazis.

However, as Einstein, Wigner, Teller, and other physicists of the time are recruited to help (even the young Asimov makes an appearance), it soon becomes apparent that the mission is doomed to failure. It cannot save its home time because changes in the past—even the mission's presence—fork the time-lines. The 21st-century villains who are helping the Nazis are not trying to change their own utopian time, but to create a congenial time-line where power rules at whim; when the stage is set, they plan to move in, oust the Nazis, and inaugurate their own reign of privileged terror.

The story's premise is marvelous, and it has plenty of good bits, from the portrayals of historical personages to the saintly treatment of a gangster to the spy-adventure assault on the Nazi time base. The best is probably the interaction of the mission's members with the New York of 1940 as they find peace, hope, and love. The worst is Hogan's well-known tendency to put the story on hold while he lectures on background and science, but—as usual—it doesn't interfere with the story enough to make me say you should avoid it.

The forking of time-lines is a consequence of quantum theory (the "many-worlds hypothesis"), and it is central to George Alec Effinger's absurdist **The Nick of Time** too, even if he does feel obliged to insist that only one line is really real. The scabrous world of 1996 is ruled by the Man from Mars—the candy company!—and food has been replaced by sweets. Yet there is hope. Dr. Bertram Waters has devised a time travel machine, and he has a certified chump, Frank Mihalik, as a volunteer intrepid temporal explorer.

Given this premise, it seems only natural that everything go wrong. Mihalik lands in the 1939 World's Fair, where his day repeats endlessly. He escapes when his girlfriend, Cheryl, brings word that he need only stand in the way of a large enough energy discharge. The two get out of 1939, but arrive in a very different 1996, where most of the populace has been relegated to recycling days like Frank's. From there, it is a romp through the fictional world of the Three Musketeers in search of agents of the Temporary Underground, and then to the battleground where the Queen of the Past and the King of the Future wage their endless war. There are equally endless intimations of Oz, with wizards galore who are incompetent to send Frank and Cheryl back to their true homes—until, finally, the recipe arrives. Frank leaves Cheryl entombed in ice as a demon while he journeys to the far future to stand under the crashing Moon. That energy discharge, you know, has to be big!

Effinger is notorious for his absurdities. Sometimes they go down smoothly. This time, however, though the nonsense hangs together in its own terms, those terms are so arbitrary that I found the book a strain to read. Part of the problem is probably that too many of the absurdities are too silly to accept, even for a moment—the Man from Mars, forsooth!

Who knows? You may enjoy the book. But if you don't, don't complain to me. You were warned.

* * *

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J. P. Miller has written two previous novels and a number of screenplays and teleplays, including "Days of Wine and Roses." Now he gives us **The Skook**, the tale of Spanish Ulysses Barrman and his resurrection to a life of love and joy. Span Barrman is married to Yovi, a sensual innocent who bestows her favors liberally. He met her first in that capacity, they were caught *in flagrante delicto*, both lost their spouses, and they married. He tries to ignore her predilections, while she tries to protect him by not making the truth obvious. He flees into a bottle and Sunday afternoons spent fishing futilely beneath a Delaware River cliff.

The action begins when a motorcycle gang decides to use Span as a human sacrifice. Unable to catch him, they dynamite his cliff, but he manages to flee into a cave. Injured, he is driven to survive by the Skook, a fantasmagorical creature who rides the Perfume of Purity across the Gulf from Otherworld to here to save the good; the Skook is a creature of his own imagination, he knows, created to entertain the children of his first marriage, but it talks to him, he sees it, and it seems to help. He explores the cave, finding vast spaces, an inland sea, blind coelacanths, sea monsters, and white sea-cave bears two stories tall (tall stories, indeed!). He nearly dies, but he manages, and in the end he escapes with the realization that he can accept Yovi's peculiar kind of love.

Meanwhile, back on the surface, Yovi is realizing how much she loved Span, as her lover maneuvers to make himself and Yovi rich by suing the company whose carelessness made the dynamite available to the gang. When Span finally shows up on Yovi's doorstep, emaciated and near death, the lover threatens murder. Yovi talks him out of it for the time being and devotes herself to Span. She nurses him, their love blooms riotously, and the future beckons. But first they must survive the lover's plots.

With the help of the Skook, they reach the happy ending that perfectly caps their modern fairy tale. I enjoyed the book. May you also.

Garry Kilworth's **A Theatre of Timesmiths** considers how people go to great pains to break the walls that limit their natures and destinies (perhaps with the aid of various pop psychologists), only to find that they have erected new walls just as constraining out of their preconceptions of potential. The setting is First City, a collection of stony tenements embedded in a cone of ice and ruled by a mad semiorganic computer served by five secret Consuls. Morag Mackenzie, who uses her strange psi talent to work as a mental prostitute, rebels and learns that she is the daughter of the woman who set up First City, using her own talents to impose a novel reality on others. Morag comes to believe the world outside the ice holds three cities set on a marble plain in a stone cavern. The computer dies. The ice melts. And lo! The world is marble, the sky is rock, and there are two more cities. There are also caverns leading elsewhere, and Morag must gain some control of her maternally-derived ability to create reality. The key, it emerges, lies with the audience's belief: If others believe reality is *so*, Morag cannot change it.

Very psychological. Very intellectual. Very unexciting. *Too* demmed British. Miller handles his closely related theme much more interestingly.

Paul Cook's **Duende Meadow** is much better. Its premise is the reality of "morphogenetic fields" that underlie

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the forms of the world. American technologists learn how to manipulate the things, and they set up the apparatus to lower an abandoned Kansas shopping mall, complete with frozen samples of many plants and animals, deep into the Earth in case of an atomic war. Other techies do the same for a nearby military base, preparing not to save the world but to fight the last battle. And the war comes. Centuries later, the two groups have merged into a two-sector society of subterranean "duendes," or ghosts, who cannot interact with the physical world as long as they are protected by the field-manipulating devices.

The story begins when duende Preston Kitteridge, Appleseed (ecologist) of the arcs, climbs the ladder that leads toward the surface, adds a few more rungs, and sticks his head out of the ground into a wheat field. The ice age has ended. The Earth has recovered, apparently on its own, without Appleseed help. But then he sees a harvester emblazoned with the letters CCCP. The Russians have won the war, reseeded the planet, and taken over the American breadbasket. Worse yet, the Russians all speak English and live in copies of long-gone American towns.

The duende military are enraged. They immediately plan to take the country back. The Appleseeds are saner, and Preston continues to study the invaders. He finds that they think of themselves as Americans, not Russians, not Communists. He learns of the guilt they labor under, of their sense of mission to save the world, and of their essential humanity. He is resolved to save them as well as his own people, but the military have a horribly sneaky trick up their sleeves, and all soon seems lost.

I will tell you no more. Cook's vision is unique, and his dream of the time after the Holocaust is refreshingly new—Imagine! A Russian guilt trip! I recommend his book.

Richard A. Lupoff is an uneven writer. Two columns ago, I reviewed his *Lovecraft's Book*, an excellent use of historical characters. Now I have **Circumpolar!** which he must have written because his success with the other made him feel that he was on a roll. Or maybe he wanted to exploit his research into the period of the 1920s by using historical characters of broader and more commercial appeal.

Circumpolar! presents an alternate reality where World War I lasted only a year and the world is a torus, a swollen disk with a hole at the North Pole and an icy rim at the South. There is another, unknown side, there is a prize for the first aviator to traverse it and return, and two teams are racing for that prize. The American team is Amelia Earhart, Charles Lindbergh, and Howard Hughes. The Russo-German team is the von Richthofen brothers and Princess of All the Russias Irina Lvova, all three selfishly bloody-minded villains. Their journey reveals a world of marvelous civilizations, including Mu, and advanced technology, including nuclear-powered mechanical flying horses. There are monsters, too.

But despite all the trappings of a fine adventure, the book falls flat. The problem is that here Lupoff's historical personages are only dimly sketched. They are stereotypes of nobility and villainy; there is no sense of the true personalities behind them. In addition, Lupoff forgets that the battery in the von Richthofens' spare dirigible is supposed to have a recharging mechanism, and his local villains fail to follow through on their threats to the American expedition. Pass it up.

* * *

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Richard Cowper's **The Custodians and Other Stories** contains only four stories, but three of them are marvelous. The memorable "The Piper at the Gates of Dawn," is even worth the price of the book. It concerns the coming of the third millennium, when life is much like that at the end of the first and many people believe the White Bird of Kinship will soon arrive and bring peace to men's hearts. The warm, loving focus is on the split-tongued boy whose music awakens the Bird, and Cowper's use of the Christ myth in no way weakens the story. At his best, Cowper is a masterful writer, thoughtful and humane, and his work should be far more popular than it is.

Of the other three, all of them good, the least is "The Hertford Manuscript," which reveals what happened to Wells's Time Traveller. (I wonder how many people have written sequels to that story?) The best is the title story, which shows us a European monastery in whose walls lies a niche from which one can see the future. "Paradise Beach" offers us a murder method possible only in SF: technology casts an illusion that, properly abetted, kills.

I first met Fred Lerner last February, at Boskone, where he chaired the panel on reviewing. I learned that this librarian and historian, a founder of the Science Fiction Research Association, has long suffered in the service of fandom, and he promised to see that I got a copy of the book that had grown from his dissertation. In return, I promised to look at it. And I did.

Fred's book is **Modern Science Fiction and the American Literary Community**. It offers some history of the field, but its main aim is to tell you what Fred learned when he delved deeply into the magazines, newspapers, and journals of the period 1926–1976 in search of the ways book reviewers, scholars, essayists, educators, librarians, and others perceived SF, how these perceptions changed over the years, and how they shaped SF's public image. The result shows SF first becoming respectable almost as soon as anyone really noticed it, right after World War II. Its later academic flourishing, however, seems due as much to academic territoriality as to anything else.

Fred is clearly a meticulous scholar, as the nature of his book clearly shows. His text ends on page 156. Pages 157 through 325 are notes, sources consulted, references, and index. However, most nonscholars will vastly prefer such other books as David Hartwell's *Age of Wonders*. Fred's style is academically dry, gaining life only occasionally, when he retails some anecdote. All but scholars will wish Fred had chosen to expand more interpretively his one short chapter of summary into the much more interesting book he might have written. ■

● Fundamentally, science must be a series of successive approximations to reality.

Dr. William O. Davis,
ANALOG, May 1962, page 85.

Submitted by G. Harry Stine

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brass tacks

Dear Mr. Schmidt,

I really want to thank you for a delightful issue for July. Two things were particularly interesting: The first was David Brin's piece on the "Great Silence." It would be interesting to see whether the rise of intelligent life forms on Planet Earth is due to one of those little-known topics that seemed to have been left out: the fact that Earth possesses a satellite with a mass 1/81 that of its primary. Could it be that such a massive satellite and its accompanying tidal interactions stimulated the process of moving some adventurous sea life onto the land, which meant more evolutionary pressures, which gave rise to larger brains for information processing capabilities?

It seems to me that once we start interstellar travel, our survey operations of planetary systems should look for terrestrial planets having large massive satellites.

The second item was the Alternate View column titled "The Technological Problem Game II." I was surprised and gladdened to be known as one of the 127 persons who responded to the first "technological problem game." I should have known that my problem of bringing the blind person into the information explosion should be considered a social, rather than a technological problem. The situation reminds me that eyeglasses were invented during the fourteenth century, but telescopes didn't come into being until the seventeenth. Apparently, social needs play a part in what does get invented and when, and how, technological improvements are to be spread throughout a society. We do have a massive social problem what with 65 percent of the adult blind population in the U.S. unemployed, and nobody doing anything about it. I'm one of those people in the frightening sta-

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tistics, and I may be a voice crying in the information wilderness, but I'm glad that *Analog* provides whatever help it can by letting me know about the latest developments. By the way, readers interested in trying to help out the blind should know about Recording for the blind in Princeton, New Jersey, an agency that produces text books from elementary school to graduate level. Maybe, some of your readers might like to volunteer their services as book readers.

I would like to share more on what the SF community can do, but this letters column isn't the place, and I don't have time, right now. Besides, this letter is getting a little long-papered anyway.

Thanks again for such wonderful entertainment.

JEFF COGSWELL

Rural Ridge, PA

Dear Editor:

I found David Brin's article "Just How Dangerous *Is* the Galaxy?" in the July issue to be a thorough update on what has become the basic question concerning Extraterrestrial Civilizations: where are they? Of particular interest to me was Brin's conjecture that the germ of the Nuclear Winter theory was Carl Sagan's uneasiness at the apparent absence of technologically advanced aliens—something that I have long suspected.

I must take exception to Brin's statement in reference to the TTAPS study, that ". . . the scientific grapevine has yet to tell of anyone who has successfully disputed the article's conclusions." On the contrary, a large number of people have poked holes in the methodology and conclusions of the study, among them forest fire researcher Craig Chandler, Cresson Kearny of Oak Ridge Lab, Joyce Penner of Lawrence Livermore, R. B. Stohers of NASA, Jonathan Katz of Washington University, and Dr. Edward Teller, to mention a few. These criticisms are covered in detail in the May issue of *Reason* magazine, in an article by Dr. Howard Maccabee, which should be read by anyone with an interest in the study, which considering its implications should be everyone.

Brin may also be unaware that the publication of the study (according to the *Reason* article) was preceded by a $100,000 public relations campaign, a "fascinating intellectual quirk" in itself which would cause skepticism under any circumstances.

Aside from this one point, the article is fine and well thought out, more than worthy of what we have come to expect from Brin.

J. R. DUNN

Orange, NJ

I'm not personally familiar with the alleged PR campaign, but it does raise interesting questions. It's certainly not the sort of thing one would normally do with a scientific study. On the other hand, if you do a study that turns up an apparent danger which urgently needs lots of attention, how are you going to get it? The normal channels of scientific communciation are neither fast nor highly visible to the public—so the ethical questions surrounding such a case are far from simple.

Dear Editor,

This is in reply to David Brin's excellent article "Just How Dangerous *Is* the Galaxy?" I am not a scientist, but rather a long time reader of *Analog* and perhaps a fellow traveler of the scientific community through avid reading.

First, I believe that the evidence points toward life itself being not too difficult to develop. So that leaves only

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one other possibility: the difficulty of developing intelligence.

On our own planet, we need only look to the dinosaur. They too were warm blooded. They held sway much longer than the mammal. So why did we make it and not they? My personal opinion is that intelligence is something that happens so rarely, that we may be the only ones in this galaxy or even in the cosmos.

A very good book, largely ignored by the scientific community, an article I highly recommend in light of Brin's article: *The Aquatic Ape* by Elaine Morgan. If her theory is correct, perhaps the required ingredients to achieve intelligence are too numerous to happen except so rarely that we are truly alone.

I will attempt to show some of her theory in capsule form. These are characteristics that aquatic (or those that started to become aquatic and for one reason or another reversed the trend and remained on land) mammals share: (1) Man is hairless. Only mammals that return to the sea lose their hair. Elephants started to return and reversed the trend and remained on land. Also, the following. Only aquatic mammals have: (2)subcutaneous fat, (3)Frontal sex, (4) Tears/weeping, (4) Bipedalism, (5) Swimming and a love of water, (6) Aquatic hair patterns. (7) Communication by sound. (8) In underwater birth, babies float and swim immediately. Babies can swim before they can walk. (9) The proboscis monkey is also aquatic and is the only primate that has a nose similar to man's. It is useful in diving, to keep water from rushing in.

Man, a primate, started in the trees to accomodate to a three dimensional environment, then went aquatic, to an even more three dimensional one. The only other mammals with a highly evolved complex brain structure are the dolphins. But they remained aquatic and were unable to become tool users.

If the theory is correct, then to achieve intelligence you need: (1) A water world, (2) A warm blooded brachiator, (3) An eons-long entrapment where there was forced accomodation to aquatic evolution by flooding, then drying out, repeated over and over again.

What the mathematical odds are against this I do not know. But I imagine they must be astronomical. So intelligence might be extremely rare. If this is so, then we have an awesome responsibility not to destroy ourselves before we can break loose into the galaxy.

I have been reading your magazine for 38 years and this is my first letter. I will write again in another 38 years.

PETER EKLUND

Merriville, IN

That may well be one possible mechanism, but why suppose it's the only *one? There are an awful lot of habitats in the universe. . . .*

Dear Mr. Schmidt:

In reference to the Science Fact article, "Just how Dangerous *Is* the Galaxy" (*Analog*, July 1985), there is one hypothesis that nobody seems to mention to explain the absence of contact from ETs.

It is this: The reason there is no contact from ET intelligence(s) is because God created life only on Terra.

Think about it. If life were so spontaneously likely an event that it should occur without the intervention of Divine Miracles, then life should exist on a virtual infinity of planets, and we therefore should have been contacted by someone out there already. If on the other hand (as seems the case), the emergence of spontaneous life is so unlikely, and any emergence requires Di-

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vine Intervention, then it becomes much more likely that we indeed are alone.

Contact Optimism—as well as Evolution—almost require a suspension of belief in God. Could it be that the Contact Optimists are driven to their optimism by a need to avoid belief in God?

The obvious objection to my argument is this: The same God who created life on this single planet of ours could just as easily have created life on many worlds. True! However, as the psalmist says, "He Who dwells in Heaven laughs." I have an idea that the human race is so perverse and ridiculous that we can satisfy even God's infinite appetite for entertainment. Our planetful of clowns is enough even for God!

JAMES A. NOLLET

Brighton, MA

Dear Stanley,

I have always appreciated you for including thought-provoking editorials on socially relevant issues in your magazine. I particularly want to thank you for your August editorial. While I am glad to see the possibility of a world without war appear in print, what I really want to acknowledge you for is the gentle, inclusive way in which you presented two viewpoints which often are expressed as being opposed. When presented as opposing positions, that just keeps the present warlike attitudes in place. Your presentation, however, is an example of what it looks like to go beyond conflict.

Thank you, and keep up the great stories, too! I look forward to my *Analog* each month.

(MISS) ROBIN N. YONASH

Sunnyvale, CA

P.S. In case you aren't already aware of them, a group that you might want to find out more about for yourself is Beyond War. Their address is 222 High Street, Palo Alto, CA 94301. Phone is (415) 328-7756.

Dear Dr. Schmidt:

I usually enjoy reading the science fact articles as much as the science fiction stories in *Analog* for the unconventional and thought-provoking points of view presented. Usually such articles are based on extrapolations of "orthodox" (if you will) science, and care is taken to ensure that the scientific content is correct, and accurately presented.

Unfortunately, in Stephen Gillett's "The Ozone Rocket" (August, 1985 issue), some misinformation is so confusingly presented that I wonder how you could have let it slip by you. Since I believe that one of your goals is to educate those of your readers who are not scientifically sophisticated, you seem to have muffed your obligation in this case.

Specifically I refer to the discussion at the beginning of the article concerning the force/mass relationship. The correct definitions are actually so simple that it is no wonder Dr. Gillett got into trouble when he tried to explain them incorrectly; but then he compounded his problem with a footnote that made things even worse!

One of the first things that a student taking a first-term college physics course learns is that in a self-consistent system of physical units you can define force or mass, but not both; the other is calculated from the relationship $F = ma$. In both metric systems of units (note, by the way, that there are indeed two: the gram-centimeter-second system and the kilogram-meter-second system) mass is the defined unit. Forces have units of "dynes" and "newtons" in the two respective systems.

In the English system, force is the defined unit, and is called a "pound."

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The unit of mass in the English system is called a "slug" and is the mass that will be accelerated at a rate of 1 ft/sec/sec by an applied force of one pound. A mass of one slug weighs ("weight" being the force exerted [due to gravity] by a mass at rest at the surface of the Earth) approximately 32 pounds. The reason that Dr. Gillett had trouble with the "pound mass" (as he called it) is because the "pound mass" doesn't exist as a proper physical quantity!

Obviously, we can't all be experts in everything, and I know that you care about keeping the science straight in both the fact and the fiction parts of your magazine. So while an occasional error is forgivable when some of the more abstruse areas of science are involved, I hope you will be more careful about letting blunders of such an elementary nature appear.

DR. HOWARD MARK

Suffern, NY

You're right about the strictly defined unit system used by physicists. However, everybody else (and even physicists at the supermarket) uses the "pound mass" far *more often than the slug.*

Dear Stan,

As another member of "our glorious military" I must reply to the letter by "an Ardent Science Fiction Reader" in the August issue. Mr. Science Fiction Reader seems to think that the job conditions of the military are not dissimilar to those of civilian jobs and that what a civilian employer would not be allowed to do the military should not be allowed to do.

Well, I have news for him. The military is a whole different ball game from a civilian job, due to the fact that at a moment's notice a soldier's or sailor's life and the lives of others depend on whether he can do his job without any chemical "additives" influencing his judgment or reactions. It is a matter of safety, just as it is in the airline industry, only even more critical because the military has at its disposal more dangerous weapons than have hijackers.

I would not like the possibility of someone who has duty in an ICBM launch facility having an LSD flashback because he dropped some "acid" a month ago. World War Three could be started because someone took drugs. Or how about a pilot with a full load of napalm crashing in some major city because, due to the fact that he was on drugs, his reaction time was slowed? Or again, how about because an ordinance man was not able to secure bombs to an aircraft properly because he is on drugs, an aircraft drops its load of armed bombs on some city?

Because the military has such dangerous weapons at its disposal, greater controls are placed upon it for the safety of all. One can't tell by looking at a person whether he is under the influence of a drug so measures must be taken to ensure that no one is using drugs.

By the way, being considered guilty just because one is accused by another is no more common in the military than in civilian life. More than an accusation is necessary, other evidence is considered, a legal case must be made; without it the defendant can go all the way to the Supreme Court just as a civilian can.

RICHARD J. PATTON

Naval Air Station

Fallon, NV

Dear Mr. Schmidt,

I bought the September 1985 issue of *Analog* at my local news stand on July 25, 1985. I am wondering what connection there is between Vol. CV, No. 9 of *Analog* and the month of September. This issue will not be for sale at

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most locations during September. Most (I am tempted to say 'all') of your readers will have read this issue by September first. If there is no particular connection, I would suggest that you do something about the misleading dating of your issues. I realize that this is a very minor point and that the practice of 'post-dating' magazines is a common practice in the publishing business. Nonetheless, I think that a magazine whose articles and stories are based on the principle of factual accuracy should pay attention to detail.

Now that I've picked my nit, I'd like to join the multitude who have complimented you on the quality of your magazine. I have trouble finding specific examples of your high quality, because excellence is the rule rather than the exception in *Analog*. I am most impressed by the authors of your opinion articles. Those authors have never argued their point by denigrating the proponents of opposing views. This is a pleasing departure from the current rhetorical confusion of an idea and its advocates.

MICHAEL ERICKSON

The man who picks the stories and articles has no control over how the issues are dated; be grateful that the latter is irrelevant to the former. Actually, as I found out when I became editor, the dating of magazines is not quite as irrational as it looks. Standard practice is that the date on the cover is when the magazine goes off *sale on newsstands. That system works fine when you have 12 issues per year, but when you have 13 (as* Analog *does) it's a little harder to come up with a system that both matches reality and is easy to understand. There is one—printing the actual off-sale date, like "May 14," but we tried that and found it confused both distributors and readers, to everybody's detriment. The present system is a compromise—it gets further and further from the actual calendar as the year goes on, but at least the sequence of the issues (with the possible exception of "Mid-December") is clear to most people.*

Dear Dr. Schmidt:

Your concept of a multitude of more-or-less loosely coupled "social pendulums" [September issue] is attractive. In spite of the risks (which you made clear) of reasoning by analogy, I would like to take the liberty of extending your concept just a bit further.

The oscillators in your article are the most "benign" kind: i.e., damping is present, and displacement is accompanied by a restoring force that is essentially proportional to displacement. But there is another type of oscillator that should not be overlooked. That is the relaxation oscillator, of which one type is known as the multivibrator. This circuit incorporates gain and positive feedback, so that any small disturbance initiates action and sends it hell-bent to one limit of its range. There it stays, until some event (a "sync pulse," or the discharge of a timing capacitor) reverses the action and sends it, with equal enthusiasm, to its opposite limit.

I suggest that some of our "social pendulums" may, unfortunately, be of the relaxation-oscillator type. Sometimes human actions feed on themselves, build momentum, and end up as mass hysteria. Examples would include phenomena like crusades, "bubbles," inquisitions, and terrorism.

The action may be augmented by such factors as modern telecommunications, semantic chicanery, and media overkill. These factors have the effect of increasing the gain-bandwidth product of our hypothetical multivibrator: that is, mak-

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ing things happen faster, more globally, and more violently.

None of this is meant to denigrate either our communications or our media. Rather, it is a call to all of us, as rational individuals, to be on the lookout for sudden mass trends and "bandwagon" events. Pause. Think. Evaluate. Otherwise, we may end up imitating the lemmings.

CHARLES H. CHANDLER

Malden, MA

Dear Dr. Schmidt:

In his "Alternate View" column, "Education and Leisure Time" (September 1985 issue), G. Harry Stine seems to believe that a liberal arts and sciences education is intrinsically superior to one with a technical orientation.

Mr. Stine is admirable when he says, "Then I got my nose rubbed hard in the technology that I loved out in the field." How many of his classmates have had the same attitude?

Is a person today literate without a basic understanding of how the ordinary conveniences used in everyday life work? More than the question of literacy, what does pride in ignorance of technology and contempt for knowledge of technology indicate? (Dr. I.M. Smarter with a Ph.D. in Anthropology, gives his lecture on the evils of modern life and the narrowness of technologists. He then drives home, turns on the air conditioning, gets a beer out of the refrigerator, and watches the TV news before preparing his videotaped course for the lunch hour classes at the local IBM plant.)

It has been my experience (I've never seen any hard data on the subject) that technologists, at least the engineers I'm familiar with, are more conversant in letters and science than liberal arts graduates are in the basics of elementary physics. This observation is only intended as a generality, but you're more likely to find an engineer in a class for aspiring fiction writers than you are to find an English major in a class on assembly language computer programming.

Mr. Stine also seems to be seduced by the current fad of accusing universities of producing vocational specialists. *No* education worthy of being called such can teach answers. No one can know all the answers! All a good education, liberal arts or technical, does is teach one how to start to commence to begin. This is exactly what Mr. Stine called out as the most important thing he learned in school.

I agree with the premise and conclusions of the column. As to the final *what kind* of education is critical to the future, I would suggest that an understanding of the natural phenomena, and of how man has harnessed and manipulated these phenomena for his own benefit (and endangerment), should be an essential part of any education.

Thanks for providing a fine magazine. I especially enjoy the "Alternate View" and Dr. Schmidt's editorials.

LYNN R. ERICKSON

Hailey, ID ■

● The quest for righteousness is Oriental, the quest for knowledge, Occidental.

Sir William Osler

Submitted by G. Harry Stine

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a calendar of analog upcoming events

28 February-2 March
PHOENIXCON 1.0 (Atlanta SF conference) at Radison Inn, Atlanta, Ga. Guest of Honor—David Brin, MC—Sharon Webb. Special Guests—Orson Scott Card, Robert Jordon. Registration—$15 until 1 December 1985. Info: Phoenixcon 1.0, % Sue Phillips, 2095 Burton Plaza Lane, #A-1, Atlanta GA 30319.

7-9 March
LUNACON '86 (NYC SF conference) at Westchester Marriott Hotel, Tarrytown, N.Y. Guest of Honor—Marta Randall, Artist Guest of Honor—Dawn Wilson, Fan Guest of Honor—Art Saha, Special Guest—Madeleine L'Engle. Registration—$16 until 26 February 1986, $20 at the door. Info: Lunacon 86, Box 6742, FDR Station, New York NY 10150.

7-9 March
CONCAVE 7/UPPERSOUTHCLAVE XVI (SF relaxacon) at Park City, Ky. Guest of Honor—John A.R. Hollis. Registration—$7 until 14 February 1986, $9 thereafter. Info: Concave, Box 90962, Nashville TN 37209.

7-9 March
BAYFILK III (SF music-oriented conference) at Red Lion Inn, San Jose, Calif. Guest of Honor—Peter Beagle. Registration—$20 until 1 February 1986, $25 at the door. Info: Off Centaur Publications, Box 424, El Cerrito CA 94530. (415) 528-3172.

14-16 March
MILLENNICON—15 at (SF conference) at Englewood Holiday Inn, Dayton, Ohio. Guest of Honor—Andrew J. Offutt, Fan Guest of Honor—Bill Cavin. Registration—$12 until 31 January 1986, $15 thereafter and at the door. Info: MillenniCon, Box 636, Dayton OH 45405.

20-23 March
NORWESCON NINE (Pacific Northwest SF conference) at Sea-Tac Red Lion Hotel, Seattle, Wash. Guest of Honor—Anne McCaffrey, Artist Guest of Honor—Kelly & Polly Freas, Fan Guest of Honor—Greg Bennett, TM—Spider & Jeannie Robinson. Registration—$20 until 1 March 1986, $25 at the door. Info: Norwescon 9, Box 24207, Seattle WA 98124. (206) 723-2101; (206) 789-0599; (206) 453-8550.

28-30 March
BALTICON XX (SF conference) at Hyatt Regency—Inner Harbor, Baltimore, Md. Registration—$15 until 15 March 1986, $25 thereafter. Info: Balticon XX, Box 686, Baltimore MD 21203.

28-31 March
ALBACON III (British National SF convention) at the Central Hotel, Glasgow, Scotland. Guest of Honour—Joe Haldeman. Registration—£9 until 1 March 1986 £12 thereafter. Info: Albacon III, % Vince Doherty, 20 Hillington Gardens, Glasgow G52 1PR, Scotland, U.K. (Use airmail outside the U.K.)

28 August-1 September
CONFEDERATION (44th World Science Fiction Convention) at Atlanta, Georgia. Guest of Honor—Ray Bradbury, Fan Guest of Honor—Terry Carr, TM—Bob Shaw Registration—$25 supporting; $55 until 15 February 1986, then more. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: ConFederation, 2500 North Atlanta Street #1986, Smyrna GA 30080. (404) 438-3943.

—Anthony Lewis

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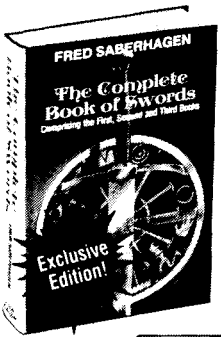

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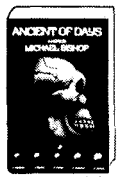

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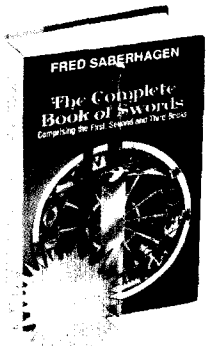

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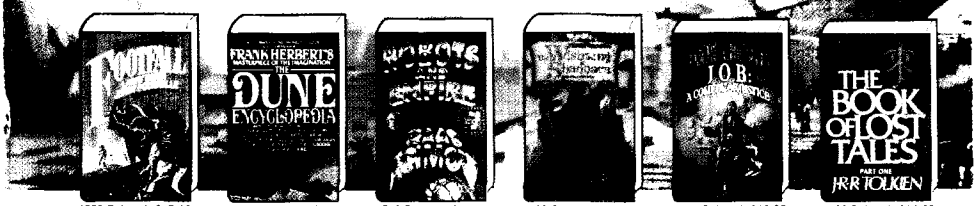

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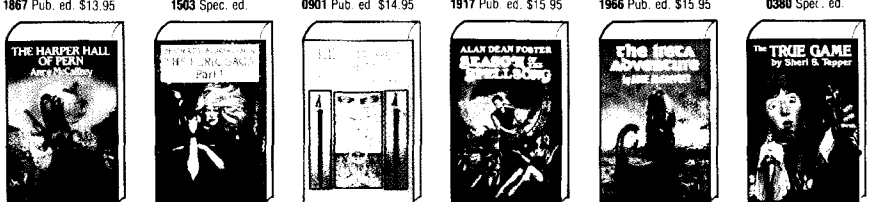

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